Defense Technology Objectives of the Joint Warfighting Science and Technology and Defense Technology Area Plan

May 1996

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INTRODUCTION AND EXECUTIVE SUMMARY

Since World War II, owning the technology advantage has been a cornerstone of our national military strategy. Technologies like radar, jet engines, nuclear weapons, night vision, Global Positioning System, smart weapons, and stealth have changed warfare dramatically. Today's technological edge allows us to prevail across the broad spectrum of conflict decisively and with relatively low casualties. Maintaining this technological edge has become even more important as the size of U.S. Forces decreases and high technology weapons are now readily available on the world market. In this new environment, it is imperative that U.S. forces possess technological superiority to prevail. The technological advantage we enjoyed in Desert Storm and still enjoy today is a legacy of decades of investment in Science and Technology (S&T). Likewise, our future warfighting capabilities will be substantially determined by today's investment in S&T.

In peace, technological superiority is a key element of deterrence. In crisis, it provides a wide spectrum of options to the National Command Authorities and Commanders in Chief, while providing confidence to our allies. In war, it enhances combat effectiveness, reduces casualties and minimizes equipment loss. In view of declining defense budgets and manpower reductions, advancing military technology is a national security obligation of ever greater importance.

To fulfill this obligation, the Director, Defense Research and Engineering has continually enhanced the strategic planning process for Defense Science and Technology (S&T). The foundation of this process is the *Defense S&T Strategy* that is supported by the *Basic Research Plan*, *Joint Warfighting S&T Plan*, and this *Defense Technology Area Plan*. These documents present the DoD S&T vision, strategy, plan, and objectives for the planners, programmers, and performers of Defense S&T. Revised annually, these documents are a collaborative product of the Office of the Secretary of Defense (OSD), Joint Staff, Military Services, and Defense Agencies. The *Strategy* and *Plans* are fully responsive to the White House National Security S&T Council *National Security S&T Strategy* and the Chairman of the Joint Chiefs of Staff's *Vision* and *Joint Vision 2010* as shown in Figure 1.1. The Strategy and Plans and supporting individual S&T Master Plans of the Military Services and Defense Agencies guide the annual preparation of the Defense Program and Budget. The Strategy and Plans are made available to the United States Government, defense contractors, and our allies with the goal of better focusing our collective efforts on superior joint warfare capabilities and improving interoperability between the United States and our allies.

The *Basic Research Plan* (BRP) presents the DoD objectives and investment strategy for DoD sponsored research performed by universities, industry, and Service laboratories. In addition to presenting the planned investment in 12 broad research areas,

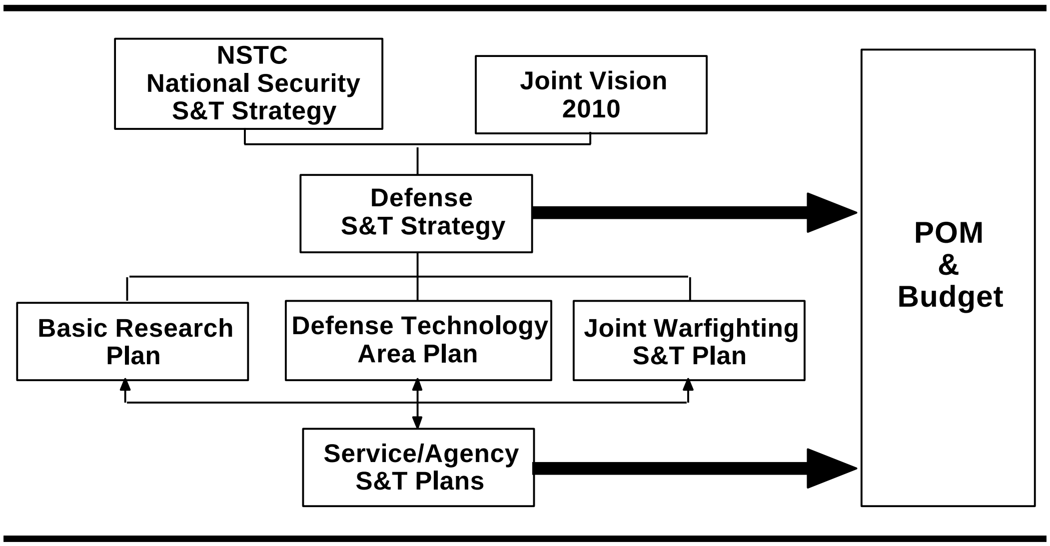

Figure 1.1. Science and Technology (S&T) Strategic Planning

this year's plan highlights six strategic research objectives holding great promise for the development of enabling breakthrough technologies for revolutionary 21st Century military capabilities.

The *Joint Warfighting S&T Plan* (JWSTP) takes a joint perspective horizontally across the Services and Defense Agencies to ensure that the requisite technology and advanced concepts for superior joint and coalition warfighting are supported. It ensures that the near-, mid-, and long-term needs of the joint warfighter are properly balanced and supported in the S&T planning, programming, budgeting and assessment activities of the DoD. The JWSTP is focused around 12 Joint Warfighting Capability Objectives. These objectives support the Joint Warfighting Capabilities Assessment and the four leveraged concepts emphasized in the Joint Vision 2010: dominant maneuver, precision engagement, full-dimension protection and focused logistics. A significant feature of the JWSTP is the identification of mechanisms for the timely transition of technology to the warfighter in the field before it is obsolete or found in the hands of our adversaries. Accordingly, JWSTP Defense Technology Objectives (DTOs) include the objectives of the Advanced Concept Technology Demonstration (ACTD) program, as well as the Advanced Technology Demonstrations (ATD) critical to achieve the Joint Warfighting capabilities.

This *Defense Technology Area Plan* (DTAP) presents the DoD objectives and investment strategy for technologies critical to DoD acquisition plans, Service Warfighter Capabilities and the *Joint Warfighting S&T Plan*. The DTAP also takes a horizontal perspective across the Service and Defense Agency efforts, thereby charting the total DoD investment for a given technology. The DTAP documents the focus, content, and

principal objectives of the overall DoD science and technology efforts. This plan provides a sound basis for acquisition decisions and is structured to respond to the DDR&E emphasis on rapid transition of technology to the operational forces.

The DTAP identifies the anticipated return on the S&T investment through nearly 200 DTOs in ten broad technology areas. Sixty-six of these DTOs support the JWSTP. Each DTO identifies a specific technology advancement that will be developed and/or demonstrated, the anticipated date of technology availability, and the specific benefits resulting from the technology advance. These benefits not only include increased military operational capabilities, but also address other important areas including affordability and dual use applications, which have received special emphasis in the *Defense S&T Strategy*.

The JWSTP and the DTAP document the focus, content and principal objectives of the overall DoD technology efforts (budget categories 6.2 & 6.3). These plans are presented in separate documents under their respective titles. This document presents the full text of all the DTOs, along with summary charts of each of the ACTDs and ATDs addressed in the JWSTP.

A. INFORMATION SUPERIORITY

A.01 Distributed Situation Assessment

A.02 Robust Tactical/Mobile Networking

A.03 Joint C4I for Rapid Force Projection

A.04 Intelligent, Joint Force Automated Battle Doctrine

A.05 Retasking and Rehearsal for Coordinated Operations On-The-Move

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A.07 Adaptive Force Package Tailoring

A.08 Theater Joint Information and Spectrum Dominance

A.09 Distributed Battlespace Opportunity Planning

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A.14 Battlefield Awareness and Data Dissemination ACTD

A.15 Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) Upgrade Prototype System (GUPS)

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A.25 Counter CC&D ACTD

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A.27 Distributed Environment Support

A.28 Global Grid Tactical Fiber ACTD

A.29 Information Security ACTD

A.30 C4I for the Grid ACTD

The Information Superiority section of this appendix provides information on several different classes of ACTDs and DTOs. Descriptions are provided for all DTOs and POCs with funding profiles and quad charts (in Appendix B) for those that have been approved and funded. Where available, funding profiles and quad charts are also provided on the candidate 1997 ACTDs. In most cases, however, funding plans are still currently being developed and this is so noted in the write-ups. In addition to these, the JWSTP includes a number of ACTDs proposed by the Advanced Battlespace Information System (ABIS) study that offer potential for near-term demonstration of substantial advances in Information Superiority capability. The funding plans are still in development for these as well. The funding profiles and associated PE's should be viewed as provisional pending completion of the planning process and identification of specific project commitments.

Beyond this, there are a number of DTOs which ABIS has identified as needed in the 2000-2010 time frame to fully realize the JCS's joint warfighting vision. DTO goals and descriptions are provided for these; however, program responsibilities and details and funding profiles for these will be developed in the out-years.

A.01. Distributed Situation Assessment. The goal is to develop an ABIS-proposed ACTD as an Adjunct to BADD ACTD to demonstrate capabilities for massive, distributed, heterogeneous database search and retrieval using the BADD distributed information servers as the information environment and the BADD WFA as the user's local client and database environment. It will emphasize several technologies and techniques for dealing with potentially ambiguous information and for creating integrated knowledge from diverse information domains. One goal will be to demonstrate the ability to create multihypothesis linkages between two or three separately managed information domains, focusing on managing consistency and ambiguity among multiple sources of red situation information. Another goal will be to create and demonstrate visual representations of multiple domain metadata with embedded hyperlinks that allow the users to create interactive, user-tailored "knowledge web objects." The ACTD will also demonstrate the use of speech recognition HCI for the WFA. These goals are consistent with the BADD goals but are beyond the scope of the currently approved and funded ACTD.

Service/Agency POC: **Customer POC:** **USD(A&T) POC:**

ABIS-proposed; management and service responsibilities to be developed.

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Programmed DTO Funding ($M): ABIS-Proposed provisional funding profile, pending development of implementation plans identifying specific PE's and projects.

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
TBD		2.5	4.5	7.0	7.0	2.0
Total		2.5	4.5	7.0	7.0	2.0

A.02. Robust Tactical/Mobile Networking. The goal is to develop an ABIS-proposed ACTD which will demonstrate capability to rapidly reconfigure tactical networks using available terrestrial, SATCOM, and relay capabilities. It will incorporate existing transport conditioning and compression, such as Radiant Tin, progressive JPEG, etc., into the transport networks to automatically adapt messages at selected gateways to tactical forces. It will demonstrate capabilities to use out-of-band "orderwires" such as skypage types of circuits and other narrowband relays to input network priorities and status from the end users to the management systems. It will demonstrate the use of the BADD warfighter's associate as a potential gateway for signal conditioning and forwarding into the tactical networks, using user profiles registered in the WFA.

Service/Agency POC: **Customer POC:**

ABIS-proposed; management and service responsibilities to be developed.

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Programmed DTO Funding ($M): ABIS-Proposed provisional funding profile, pending development of implementation plans identifying specific PE's and projects.

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
TBD		1.0	1.0	1.0	1.0	0.5
TBD		1.0	1.0	1.0	1.0	0.5
TBD		0.5	2.5	5.0	5.0	1.0
Total		**2.5**	**4.5**	**7.0**	**7.0**	**2.0**

A.03. Joint C4I for Rapid Force Projection. The goal is to develop an ABIS-proposed ACTD which will demonstrate the ability to provide rapid, just-in-time/just-enough command and control support for joint operations through the use of linked planning tools, on-the-move asymmetric communications, simulation, and intelligent triggers and alarms. The emphasis will be on developing operation plans at two levels: at the high level to determine feasibility of the linked planning areas prior to initiating the deployment; at the detailed level for the increments that are being executed at the current time and in the immediate next phase. The demonstration will show the effectiveness of automated linkage of the individual planning tools and the use of rapid (simulated) projection of operational feasibility to develop a "rolling plan" that can be executed for the initial stages even while subsequent stages are under development. The ACTD will also demonstrate the ability to bring air assets to bear early in the operation by developing "broadly defined" air tasking that can be refined as the aircraft reach the objective area. The ACTD will demonstrate real time coordination between the air C2 and execution systems and the CJTF's early entry C4I systems to refine air tasking and assign specific targets "on the fly." The ACTD will demonstrate the use of automatic triggers and alarms to help the battle management staffs keep track of critical information, to track uncertainties, and to manage critical linkages between planning and execution areas. Collaborative virtual workspace technology will be used to provide an in-transit virtual command post.

Service/Agency POC: **Customer POC:**

ABIS-proposed; management and service responsibilities to be developed.

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Programmed DTO Funding ($M): ABIS-Proposed provisional funding profile, pending development of implementation plans identifying specific PE's and projects.

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
TBD		2.0	2.0	2.0	2.0	2.0
TBD		1.0	1.0	1.0	1.0	1.0
TBD				2.0	5.0	7.0
TBD		7.0	7.0	5.0	2.0	
Total		**10.0**	**10.0**	**10.0**	**10.0**	**10.0**

A.04. Intelligent, Joint Force Automated Battle Doctrine. This ABIS long-term DTO will address objective capability for intelligent, distributed, cooperative, automated battle doctrine management for joint force integrated offense, defense, and survivability, to include:

- Distributed, cooperative doctrine intelligent enough to provide "legal"-quality cues for rules of engagement on evasive and deceptive tracks.
  - — Checklist of ROE options, deferral of response decision as long as practical
  - — Recognition of enemy cooperative tactics and similar patterns
  - — Automated provisions for management of uncertainty
- Integration of soft kill and avoidance into automated response recommendations.
  - — Determine and rank C2W, deception, signature/spectrum management, dispersion options within 1 minute
  - — Simulation of countermeasures effects and signature reduction in 2-minute medium confidence, 5-minute high confidence
  - — Develop/disseminate automated unit tasking in seconds following option selection
- Over-the-horizon engagement coordination (extension of battle horizon and increased depth of fire).
  - — Detection sharing on a contact-by-contact basis
  - — Real-time linking of contact engagement/engageability information across the force
  - — Cooperative engagement and forward pass

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
ABIS-proposed; management and service responsibilities to be developed.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

A.05. Retasking and Rehearsal for Coordinated Operations On-the-Move. This long-term DTO will address objective capabilities for retasking and rehearsal for coordinated operations enroute and on-the-move, to include:

- Dissemination of enroute coordinated task changes to tens of units in minutes
  - — Retargeting/weaponeering information and mission folders
  - — Mission route, timing, and coordination information
  - — Dissemination and preview of alternative targets, contingency threat sets, and contingency tasks
  - — Dissemination and preview of countermeasures options, response libraries, and effects
  - — Mission preview
- Coordinated multi-mission, multi-echelon rehearsal of coordinated operations and simultaneous engagements (tens)
  - — Force-to-force combat task and logistics simulation
  - — Synchronized sensor-to-shooter-to-shooter walkthrough
  - — Constructive, simulated threats and “virtual own force presence”; simulated IW/C2W and deception; tactical or rear echelon “red team” anchor desk.
  - — Mission critique

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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A.06. Distributed Empowerment. This long-term DTO will address objective capabilities required to empower commanders and warfighters at all levels to act decisively and effectively, as follows:

- Dynamic tasking tied to central strategy
  - — Distributed real-time database consistent with "strategy-to-task" hierarchy of predictive battlespace opportunity planning
  - — Distributed database dynamic updates to critical node hierarchy and strategic attack priorities
  - — Continuous distributed posting and deconfliction of task/target/time/space/ spectrum allocations
  - — Concurrent assessment of task progress toward desired end-state
- Support to tens of simultaneous coordinated operations
  - — Distributed real-time database to update 5,000 task-to-task dependencies, assumptions, and temporal/geographic/resource constraints; and involving hundreds of participating units
  - — Dynamic, distributed reallocation of shared and excess assets (aircraft sorties, surveillance, weapons, C3, and processing) to most critical tasks and targets IAW central strategy
  - — Automated, distributed coordination of supporting tasks (e.g., massed fire support) and allocation of multi-mission-capable assets.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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A.07. Adaptive Force Package Tailoring. This DTO will address objective capabilities to enable commanders to obtain information tailored to their mission needs and to dynamically adapt to changing tactical situations in real time.

- High resolution tactical joint force package tailoring
  - — Ability to modify national forces database in <1 hour
  - — Ability to plan major force reconstitution based on casualty assessments and new missions within 15 minutes
  - — Ability to rearrange support logistics for rapid unit level relocation within 2 hours
  - — Ability to detach, reassign, and realign support tail for brigade/unit forces within 3 hours
- Reduction of force movement and supply backlog during dynamic reconstitution and redeployment
  - — Reduction in total life/time to redeploy due to in-theater reconstitution, lightweight forces, and increased lethality (less munitions) and survivability (high mobility, signature reduction)—1-4 days in theater and 7 days from CONUS
  - — 50 percent reduction in logistics response time CONUS to overseas
  - — Reduction in total CONUS and intermediate support base backlog by 30 percent due to tactical reconstitution and better tracking of mission requirements and flow *(ODS shipped X5 ammunition, X80 antitank ammo vs actual requirement)*
  - — 10 percent reduction of basing/distribution costs to manage flow of units and materials arriving to support current missions without backlogs or shortfalls to critical operations (commercial experience)
  - — 50 percent reduction in global contingency inventory and storage *(current DoD Log Strategic Plan estimates 30 percent)*

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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A.08. Theater Joint Information and Spectrum Dominance. This long-term ABIS DTO will address capabilities for effective integration of IW and C2 to achieve theater-wide joint information and spectrum dominance

- Ability to monitor information and frequency space
  - — IW/C2W BDA assessment capability for critical nodes, events
- Predictive control of IW/C2W options
  - — Distributed, high fidelity simulations of effects vs "cost" of IW and C2W options from rear-echelon anchor desks in hours
  - — Prepositioning of IW and C2W countermeasures parametric and coordination information in tens of minutes

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
ABIS-proposed; management and service responsibilities to be developed.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

A.09. Distributed Battlespace Opportunity Planning. This long-term DTO will address objective capabilities for distributed battlespace opportunity planning, providing look-ahead, multi-option optimization to a central offensive and defensive strategy across time, space, resources, spectrums, including:

- Precision attrition planning and evaluation
  - — Integrated IW, C2W, hard kill options generated and evaluated in tens of minutes for tens of critical targets
  - — Stealth and enhanced penetration/minimum collateral damage/WMD options planning in <1 hour for hardened facilities and well defended sites

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
ABIS-proposed; management and service responsibilities to be developed.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

A.10. IW Battle Management. The goal of this Near Term ABIS proposal is to develop an ACTD which will demonstrate an initial prototype IW surveillance network for a selected set of computers and communications, using existing firewalls, mail guards, MLS guards, etc., as the IW surveillance nodes. It will demonstrate the ability to monitor and display near real time IW status in the form of events, "tracks," and estimates equivalent to an operational situation display. It will establish and demonstrate mechanisms to illustrate the ability to couple IW surveillance information into the network management systems. It will also support planning for both defensive and offensive IW actions in response to perceived or actual threats or attacks. An important aspect is the integration of this operational capability into the normal Force Management C4I system.

Service/Agency POC: **Customer POC:** **USD(A&T) POC:**

ABIS-proposed; management and service responsibilities to be developed.

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Programmed DTO Funding ($M): ABIS-Proposed provisional funding profile, pending development of implementation plans identifying specific PE's and projects.

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
TBD			3.0	3.0	2.0	1.0
TBD			3.0	3.0	3.0	1.0
Total			**6.0**	**6.0**	**5.0**	**2.0**

A.11. Integrated Collection Management ACTD. The goal is to develop an ACTD which would demonstrate integrated collection management of SIGINT and IMINT national and theater sensors to optimize collection for theater needs. Other platforms and sensors will be included in the planning process for later insertion. The ACTD should address the following:

- integrated collection management of airborne and national assets
- all source tasking
- dynamic retasking of sensors
- tasking within enemy operating cycles (less than 24 hours, goal of 2-4 hours)

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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Programmed ACTD Funding ($M): FY97 candidate proposed. Provisional funding profile, pending completion of implementation plans.

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
TBD		8.0	9.0	7.0		
Total		**8.0**	**9.0**	**7.0**		

A.12. End-to-End Task Synchronized Mission Support to the Warfighter. The long-term ABIS DTO will address effective automation of end-to-end sensor-to-shooter targeting support as follows:

- Dynamic, distributed joint target/BDA coordination strategy for thousands of targets across theater of operations
  - — Near real-time tactical visibility of multimission target priorities and strategy (or center of gravity)-to-task-to-target relationship
  - — Near real-time tactical visibility of mission support package available
  - — Near real-time visibility of ISR coverage at tactical level
  - — Near real-time visibility of ISR tasking/availability
- Distributed, automated aids for time-critical, man-intensive processes
  - — Automated target recognition to locate/ID thousands of targets per hour
  - — Automated target assessment/targeteering to thousands of targets per hour
  - — Automated weaponeering of hundreds of targets per hour
  - — Automated BDA/combat assessment of hundreds of targets per hour
- On-line, collaborative access to virtually deployed analysts for target assessment, weaponeering, BDA, combat assessment at tens of sites

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
ABIS-proposed; management and service responsibilities to be developed.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

A.13. Rapid Battlefield Visualization ACTD. The goal of this ACTD is to demonstrate capabilities to collect source data and generate high resolution digital terrain databases rapidly to support crisis response and force projection operations within the timelines required by the joint force commander. The objective timelines identified by the user are a 20 x 20 Km area in 18 hours; 90 x 90 Km in 72 hours; and 300 x 300 Km in 12 days. The RBV-ACTD will also demonstrate capabilities for the commander to integrate these terrain databases with current situation data, and manipulate and display the integrated databases to determine how to achieve his objectives and visualize his desired end state. A capability for rapid collection of high resolution (up to 1 meter grid spacing) digital terrain elevation data will be demonstrated. Imagery from aircraft and satellite platforms will be used to generate terrain feature data and map backgrounds. The RBV-ACTD will provide and leave behind the computer workstations and applications software to (1) generate high resolution terrain databases; and (2) analyze courses of action using mission planning and embedded wargaming software and conduct mission rehearsals. This ACTD will also provide a tool for further exploration of emerging warfighting concepts and doctrine. Four elements will be integrated: (1) source data collection, (2) digital terrain database generation and tailoring, (3) database dissemination, and (4) applications software. Six parameters will be evaluated: (1) rapid access to archived terrain data and imagery; (2) rapid collection of high resolution terrain elevation data and multi-spectral imagery using a tactically viable platform; (3) rapid generation of digital terrain databases including semi-automated extraction of some terrain features; (4) tailoring of terrain databases to meet specific user needs; (5) a hierarchical spatial database management system that will accommodate dynamic revisions and provide users quick access to data sets optimized for their needs; and (6) mission planning, rehearsal, course of action analysis, and embedded wargaming software to enable the commander to determine the best course of action to achieve his projected situation.

By FY98, demonstrate capability to satisfy Army requirement for 20 Km x 20 Km terrain data set in 18 hours and use data to plan crisis operations. By FY99 meet 72 hour requirement for 90 Km x 90 Km terrain data set, integrate with intelligence and situations awareness data, and wargame courses-of-action. By FY00, demonstrate ability to collect 1 meter resolution digital terrain data over 300 x 300 Km area, generate tailored databases, and support battlefield visualization systems to provide overwhelming tactical advantage in the battlespace.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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Projected/Proposed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
63734A/		9.9	12.4	16.9	16.1	3.0
Total		**9.9**	**12.4**	**16.9**	**16.1**	**3.0**

A.14. Battlefield Awareness and Data Dissemination ACTD. The goal of this ACTD is to provide a consistent view of the battlefield using direct digital broadcast satellite (DBS) technology. It will disseminate operational, intelligence, and logistics information widely and inexpensively throughout a theater of operation. The ACTD will also provide battlefield-wide digital connectivity through the use of commercial and military information management technology to create a “tactical internet”. Deployed forces will be able to request specific information using the tactical internet and receive it via direct broadcast. By FY97, demonstrate in CONUS an end-to-end system in support of TF XXI and Sea Dragon. By FY98, demonstrate the capability OCONUS. Leave behinds: information dissemination server and Pilot Service in support of evolving global Broadcast Service, and at least 30 GGCS compliant workstations, associated software, and communications interface equipment.

Objectives:

Allows commanders to design/tailor their own information systems

Intelligent push of information

Consistent picture of the battlespace

Query capability for warfighter

Enable total battlefield awareness

Broadcast information services instead of point-to-point data delivery

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
63226E/EE2V40153	17.2	35.6	54.0	56.9	22.0	
Total	**17.2**	**35.6**	**54.0**	**56.9**	**22.0**	

A.15. Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) Upgrade Prototype System (GUPS). GEODSS currently has three sites at Maui, Socorro, and Diego Garcia to collect positioning and intelligence data used by theater commanders for mission planning and execution. Air Force Space Command has two significant gaps (Pacific and Atlantic) with zero coverage. GUPS is a much higher performance system with more accurate observations capable of detecting ten-times dimmer objects, searching and tracking twice as fast, and easily integrated into existing GEODSS network. It can also be used for asteroid detection and near-earth observation, if prioritized. GUPS is approximately one-third the cost of a new fixed ground site and its ability to relocate will improve ability to deal with basing rights issues. The contract was awarded in September 1993. CONUS Demo is currently underway with Search and Track to begin demo in January 1996.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
Not available	Not available	LTC Don Blackwelder DUSD(AT) 703-695-8044 blackwdi@acq.osd.mil

OUSD(A&T) POC:,

Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
6xxxxF, AF 3600	3.2	0.6				
0603750D/ACTD	0	TBD				
Total	**3.2**	**TBD**				

A.16. Unattended Ground Sensor (UGS) ACTD. The objectives of the Unattended Ground Sensor ACTD are: (1) to demonstrate the use of unattended ground sensors for environmental measurement (non weather), (2) to develop the use of UGS for deep strike by monitoring choke points, lines of communications, and fixed sites, (3) to improve the base of use of UGS by demonstrating emplacement means, long haul communications options and processing nodes, and (4) to address affordability issues to increase the quantity of these sensors to meaningful levels. The UGS will be integrated into a coherent ensemble for use on the battlefield. Communication paths and Processing software need to be developed. Technology exists for all of the components needed for this ACTD. UGS promises to add dimensions of sensing the battlefield which are not available with current sensors.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
DARPA	USSOCOM	Dr. Charles Perkins
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Programmed DTO Funding ($M): FY97 candidate; provisional funding profile.

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
602784A/TBD						
63772A/TBD						
63226E/TBD						
0603750D						
Total		**13.0**	**12.0**	**12.0**	**1.0**	**0.5**

Pending development implementation plan and identification of specific PE's/projects.

A.17. Operator/Intelligence Interface ACTD. This candidate ACTD levers the intelligence correlation work that was developed under the Warbreaker Intelligence and Planning thrusts. ARPA-developed systems that automatically update databases from Intelligence traffic are in use in EUCOM today. SIGINT correlators from this program are in use in National SIGINT facilities. This ACTD addresses the need for robust intelligence that is developed rapidly and displayed in a command-tailorable format. The schedule is to transition SIGINT correlation to the Army in FY96. Standup interim system at CENTCOM for TCT tracking and validate reference architecture and force model in FY97. Standup system at EUCOM (distributed at multiple nodes) and demo complete Battlefield Awareness in FY98. Deployed capabilities will be upgraded in FY99.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
Army	CENTCOM & EUCOM	Mr. Bruce Deal DUSD(AT) 703-697-6446 dealb@acq.osd.mil

Programmed DTO Funding ($M): FY97 candidate; funding profile is currently under development. Provisional estimates provided to be validated

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0603750D/ACTD		TBD				
Total						

A.18. Semi-Automated Imagery Processing ACTD. Rapidly produce and field a capability that will significantly improve an image analyst's (IA's) ability to provide accurate, timely situation awareness to warfighters. The system will be demonstrated in a van configuration consisting of several IA workstations, a mass storage capability to provide memory for change detection, and an advanced processing resource to execute the image search and ATR algorithms. The advanced processor will be a cluster of processors to allow for both flexibility and speed. The van configuration will be available in January 1998 as a "leave-behind" capability. In addition, there will be a hardware software configuration that can be replicated as required into any environment that is capable of providing power and space for approximately three 19-inch racks of equipment.

Service/Agency POC:
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Programmed DTO Funding ($M): FY96 ACTD; funding profile is currently under development.

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
0602301E/ST11	1.7	3.0	3.0			
0305154D/DARO	3.0	6.0	6.0			
0603226E/EE40	29.8	10.0	4.3			
0603750D/ACTD	2.0	4.0	2.0	2.0		
Total	36.5	23.0	15.3	2.0		

A.19. Knowledge-Based Information Presentation. The goal of this long-term DTO addresses a set of warfighting needs for:

- On-line, collaborative access to full range of MC&G and environmental products over 10,000s of sq. km
  - — 30m resolution "smart maps" in 10s of minutes for situation/plan reasoning—auto feature extraction for rapid all-source production
  - — 10m resolution maps in minutes for tactical and targeting situations
  - — Collaborative mapping to merge commercial, imagery, and reconnaissance in minutes, with auto downgrade/release capability
- Fused, all-source picture tailored to required level of aggregation and security classification
  - — Enemy forces identified with tactical unit association and uncertainty
  - — Automated association of dissimilar products (images, SIGINT, etc.)
  - — 98 percent awareness of "movers" over 5,000 sq. km area
  - — Releasable coalition picture with <1 min delay
  - — Fusion and access to non-DoD information at specified "quality of service"
- Fused blue picture which reflects status, planned events, capabilities, and uncertainty
- Situation projection for own and enemy COA estimation
  - — Continuous 1-5 min projection for designated targets, 20 min-1 hr projection for "movers" and 6-24 hr projection for major forces
  - — Uncertainty projection and management

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
ABIS long-term DTO. Program details and funding profile to be developed.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

A.20. Cognitive Mission Support to the Warfighter. The goal of this long-term DTO is to relieve the warfighter's information load by:

- Tailored visualization and knowledge-based presentation of situation, plan, and execution status at varying levels of aggregation
  - — Visibility of mission, centers of gravity, commander's intent, and information requirements to dynamically drive coordinated operations at levels of detail (crisis action, current operations, future operations, future plans)
  - — Mission readiness matched to mission and task requirements
  - — Mission capabilities projected vs. weather, terrain, and logistics constraints
- Collaborative situation and BDA assessment among Intelligence centers
  - — Resolution of differing assessments of situation within decision cycle (minutes for time-critical tactical decisions and BDA, 10s of minutes for force coordination decisions)
  - — Deception recovery; protection and tolerance of GPS degradation
- Common representation for battlespace "understanding"
  - — Representation of completeness, uncertainty, and deception indicators
- Collaboration on and dissemination of "understanding" to all warfighters

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
ABIS long-term DTO. Program details and funding profile to be developed.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

A.21. High Altitude Endurance UAV ACTD. Develop and demonstrate a Joint, adverse weather, long-endurance, wide area, day/night reconnaissance and surveillance capability in both a low observable (LO) and conventional (Conv) configuration. The only requirement for each system is that the fly-away price of each air vehicle be <$10M, all other characteristics (range, altitude, payload, etc.) are flexible. Conduct initial LO flights in FY96 and Conv flight tests in FY97. Begin limited LO user demonstrations in FY97 and full-up user demos of both LO and Conv in FY98-99. The UAVs will carry a variety of EO, IR, and SAR sensors as well as wideband satellite communications. At the end of the ACTD (early FY00), transition a mix of one or both systems to the Air Force.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0305154D	63.0	78.0	66.0	50.0	25.0	10.0
0603226E	23.9	13.7	5.0			
03051540/P527	103.0	100.0	94.0	115.0		
Total	**189.9**	**191.7**	**165.0**	**165.0**	**25.0**	**10.0**

A.22. Medium Altitude Endurance UAV ACTD. Rapidly develop and demonstrate a Joint, long-endurance, day/night reconnaissance and surveillance capability in a low cost, off-the-shelf, unclassified system. In FY94, conducted initial flight testing and begin demonstrations with the EO and IR sensors. In FY95, conducted overseas deployments in support of contingency operations. By FY96, demonstrate full capability including synthetic aperture radar, wideband satellite communications, 24+ hour endurance and near real-time motion video direct to the Joint Force Commander. At the end of the ACTD (June 96), transition three systems (each system includes 1 ground station and 3-4 air vehicles and Trojan Spirit communications) to the gaining Service along with trained crews and demonstrated concepts of operation.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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UAVJPO	HQ USACOM	DUSD(AT)
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Programmed DTO Funding ($M):

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
0305154D/P527	45.0	17.2	9.5	5.0		
Total	**45.0**	**17.2**	**9.5**	**5.0**		

A.23. Small Satellite SAR ACTD. The ACTD would be a cooperative venture with the European SAR SAT (HORUS) development. The ACTD would cover development, launch, and initial operation of a small constellation of small SAR satellites. The small SAT SAR is expected to be a 1m resolution strip map mode sensor. The location of the collection strip would be controlled in theater. The processing would be done onboard or on the ground in theater. The technology has been assessed by industry and is considered available for integration into a spacecraft. The ACTD would provide a tactical SAR sensor that was not restricted by overflight considerations. The in-theater infrastructure would be limited to processing and a minimum amount of tasking. The sensor would not interfere with air operations. The international operation of the sensor system would permit ready sharing of intelligence data. This 5-year program would have a scheduled FY97 start.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
NRO/ARPA/AF	USEUCOM/US SPACECOM	Dr. Charles Perkins DUSD(AT) 703-697-3568 perkincw@acq.osd.mil

Programmed DTO Funding ($M): FY97 candidate; funding to be developed, provisional estimates pending international agreement. Nominal provisional funding profile, assuming equal cost sharing by foreign partners.

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
TBD						
TBD						
TBD						
Total						

A.24. Wide Area Tracking System (WATS) ACTD. This program will demonstrate the capability to automatically detect and provide warning/response to vehicle delivered nuclear threats to typical air base or port facilities by 1998. The technology is well in hand for nuclear detection based on previous efforts within DOE and DNA. Existing nuclear detectors will be integrated into C4I/Warning system/displays.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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		critest@acq.osd.mil

Programmed DTO Funding ($M):

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
DOE (NN-20)		0.5	0.5	0.5	0.5	
DNA		.25	.25	.25	.25	
0603750D/ACTD		0.25	0.25	0.25	0.25	
Total		**1.0**	**1.0**	**1.0**	**1.0**	

A.25. *Counter CC&D ACTD*. This ACTD focuses on foliage-penetrating radar (VHF or UHF) and the use of Hyper Spectral Imaging (HSI) on high altitude platforms to detect and identify obscured and camouflaged targets. The preferred radar frequency and the wavelength and number of bands required for the HSI is still being developed. A significant outcome will be a CONOPS for the use of this class of sensors on the battlefield. The current suite of theater surveillance and reconnaissance lacks the capability to reliably detect CC&D targets or to penetrate any level of foliage. This capability is essential to achieving total battlefield awareness. ACTD Concept Definition and HSI on Predator Demonstration are planned for FY97. Real-time Processor Demonstration is planned for FY98. The FOPEN radar capability will be integrated into the ACTD upon completion of the DARPA ATD.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
DARPA	USAF/USA/USN	TBD

Programmed DTO Funding ($M): FY97 candidate; funding to be developed. Profile shown is for technology development of Penetrating/Identification Radar, critical to Demo.

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
ARPA 60322E/EE41	24.7	30.2	31.4	32.5	8.7	
0603750D/ACTD		TBD	TBD	TBD	TBD	
Total						

A.26. Universal Transaction Services. This is an ABIS-proposed long-term DTO whose ultimate goal is to provide the users the ability to exchange and understand information, unimpeded by differences in connectivity, processing, language, or interface characteristics. In particular, the following attributes should be able to be developed and demonstrated.

(1) Automated interfaces for determining the necessary translations that need to be applied at network nodes where interfaces occur between systems of differing characteristics.

(2) Techniques for enhancing the commercially available signal conditioning and for introducing automated brokering of user preferences (profiles) and network characteristics to determine the appropriate type of conditioning.

(3) Provision of dynamic profiles and adaptive conditioning in gateways to the tactical extension networks.

(4) Automatic, adaptive addressing to allow connections to be made to users completely independent of any knowledge of his location.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
ABIS long-term DTO. Program details and funding to be developed.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

A.27. Distributed Environment Support. The ultimate goal of this ABIS long-term DTO is to provide all mechanisms and services required to allow the users to craft their C4I information environments from the full set of assets connected through the grid, including ability to establish distributed virtual staffs, to share a common consistent perception of the battlespace, and to construct distributed task teams among sensors, shooters, movers, and command posts. In particular, the following attributes should be able to be developed and demonstrated:

(1) Advanced intelligent agents for information discovery and retrieval in massive, heterogeneous, distributed environments.

(2) Ability to fuse information, resolve ambiguities, track multiple hypotheses and assumptions; ability to link intelligent agents in the warfighter's associate with ones in other computers in the network to establish a distributed warfighter's asociate function.

(3) Merging of capabilities developed and demonstrated in the BADD ACTD with capabilities developed for ambiguity resolution, consistency management, distributed information discovery and retrieval, HCI, and cognitive support (e.g., visualization, information integration) to achieve orders of magnitude improvement in the ability to see and understand information provided from the distributed sources. Emphasize the ability to help the user deal with the massive volume of information that can be provided via wideband links.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
ABIS long-term DTO. Program details and funding to be developed.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

A.28. Global Grid Tactical Fiber ACTD. This ACTD is a three-phase program. Phase I will focus on rapid cable laying to near-shore environment and providing wet connect I/F; Phase II will focus on littoral deployment onto shore; and Phase III will focus on expanding tactical interfaces ashore. The key technology for this ACTD is fiber optic technology. Key engineering/CONOPs issue would be the rapid deployment of the back of an LCAC to provide support to a littoral insertion. This ACTD will develop the means by which the fiber is integrated into inter- and intra-theater communications.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
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Lt. Col. William Barrtion		
DISA JIEO		
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OUSD(A&T) POC:, Phone:

Programmed DTO Funding ($M):

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
TBD		4.8	TBD	TBD	TBD	TBD
TBD		1.0	TBD	TBD	TBD	TBD
Total		**5.8**	**10.0**	**12.0**	**4.0**	**2.0**

A.29. Information Security ACTD. The goal is to develop an ACTD which would demonstrate the use of existing guards, gateways, and multilevel workstations to provide automated interfaces among U.S. and coalition forces. Prior JWID demonstrations showed feasibility of using specific pieces of equipment to provide such interfaces, and the ACTD will build upon those demonstrations to achieve a higher degree of integration across the systems, rather than the case-by-case or link-by-link capabilities that have been the focus of the prior demonstrations. The ACTD will also attempt to provide cell encryption gateways for extending ATM networking across the coalition networks, building upon FASTLANE and other emerging products.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
FY97 Candidate, responsibilities to be determined.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

Programmed DTO Funding ($M): FY97 candidate; provisional funding profile pending development, validation of implementation plans.

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
TBD		7.0	7.0	5.0	2.0	2.0
Total		**7.0**	**7.0**	**5.0**	**2.0**	**2.0**

A.30. C4I for the Grid ACTD. The goal is to develop an ACTD which will demonstrate capability to exercise federated management of JTF and component networks using JCPMS and existing Service systems, augmented by visualization aids that allow the network status to be projected onto the OPLAN and onto specific mission plans. It will also demonstrate capability to use simulation and modeling tools to project operational plans into the network loading and analysis systems to begin to develop anticipatory network management capabilities.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
TBD	TBD	TBD

Programmed DTO Funding ($M): ABIS candidate; provisional funding profile pending development of implementation plan.

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
TBD		5.0	5.0	5.0	5.0	5.0
TBD		1.0	1.0	1.0	1.0	1.0
TBD		2.0	2.0	2.0	2.0	2.0
TBD		2.0	2.0	2.0	2.0	2.0
Total		**10.0**	**10.0**	**10.0**	**10.0**	**10.0**

A.31. Assurance of Services. The ultimate goal of this ABIS long-term DTO is to provide high quality services that the users can be assured will be available whenever and wherever needed, that can be adapted, scaled, and projected to meet dynamically changing demands, and that can be defended against physical and Information Warfare threats. In particular, the following attributes should be able to be developed and demonstrated:

(1) Advanced tools for cross-coupling the network planning and management systems with the operational planning systems. This should include rapid requirements generation using models and simulations as well as visualization techniques to allow the operational commanders and staffs to view the implications of C3I networks on this mission success projections.

(2) The automated integration of information across systems and networks of varying levels of classification, including the electronic connection of U.S. and coalition systems. R&D also needs to be performed to support the control of access to information at the individual information element level, the individual user level, and the model-based aggregate level.

(3) Technologies to detect, correlate, and characterize IW events. Develop and demonstrate techniques to project the IW surveillance information into the network management systems. Include the demonstration of HCI and visualization techniques that allow the users to view the grid status in terms of impact on ongoing and planned operations.

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
ABIS long-term DTO. Program details and funding profile to be developed.		V. Castor ODDR&E 703-695-0005 castorvl@acq.osd.mil

A.32. Joint Tactical UAV ACTD. The TUAV must provide the Army Brigade, USMC Marine Air Ground Task Force, and Navy commanders with a dedicated unmanned aerial vehicle system that delivers timely, accurate, and complete targeting and other battlefield information to their units in near-real time (i.e., military utility). The cost (including profit/fee) of the 33rd air vehicle with payload should not exceed $350K, and the cost (including profit/fee) of the 100th air vehicle with payload should not exceed $300K. The TUAV system must come as close as possible to meeting the basic performance requirements.

The TUAV system consists of Ground Control Equipment (GCE), one Remote Video Terminal (RVT) to provide payload information in the area of operation, four Modular Mission Payloads (MMPs), communications devices, four air vehicles (AVs), a means of launch and recovery, and one Mobile Maintenance Facility for every three TUAV systems. (Note: For ILS planning purposes, a TUAV system for the Navy produced during full-rate production would consist of eight air vehicles and Modular Mission Payloads, as well as maintenance facilities configured to the specific ship.)

Service/Agency POC:	**Customer POC:**	**USD(A&T) POC:**
COL Roger L. Duckworth UAV Joint Project Office 703-604-1088	Maj Doug Adams USA Army DCSOPS 703-695-4222	Mr. Tom Perdue DUSD(AT) 703-695-8045
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	CDR Otto Wiegle NAVYN8 703-697-1466	

Programmed DTO Funding ($M):

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
TBD	47.6	51.4	34.1	11.0		
Total	47.6	51.4	34.1	11.0		

B. PRECISION FORCE

B.01 Precision Rapid Counter Multiple Rocket Launcher ACTD

B.02 Rapid Force Projection Initiative ACTD

B.03 Precision SIGINT Targeting System ACTD

B.04 Survivable Armed Reconnaissance on the Digital Battlefield ACTD

B.01. Precision Rapid Counter Multiple Rocket Launcher ACTD. Develop and demonstrate a Joint adverse weather, day/night end-to-end, sensor to shooter, precision deep strike capability to locate, identify and kill high value, short dwell, time sensitive targets and assess damage within tactically meaningful timelines. This effort will demonstrate a significantly enhanced capability for U.S. Forces Korea (USFK) to neutralize the newly deployed North Korean 240mm multiple rocket launcher system. Because of the brief time in which these targets are expected to be exposed and vulnerable to counterfire, near continuous surveillance and near instantaneous target acquisition will be required.

By FY97, demonstrate, in Korea, the capability to defeat the 240mm MRL threats and leave behind a platoon of UAVs with 2nd generation FLIR/LS sensors, a KCOIC to 2ID connectivity, an automated black TAC, and a capability to neutralize 240mm MRL.

This capability will provide the Warfighter with the ability to destroy selected targets with precision while limiting collateral damage. It includes a precision guided munition, surveillance, and targeting capabilities.

Service/Agency POC:	**Customer POC:**	**USD (A&T) POC:**
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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
603238A/AD177	15.8	0	0	0	0	0
603750D	5.7	16.6	13.3	5.0	0	0
Total	**21.5**	**16.6**	**13.3**	**5.0**	**0**	**0**

B.02. Rapid Force Projection Initiative ACTD. The Rapid Force Projection Initiative (RFPI) ACTD will demonstrate automated target transfer from forward sensors to standoff killer weapon systems with the capability to engage high value targets beyond traditional direct fire ranges. Target transfer will be facilitated by tactical digital data transfer systems being developed as part of the U.S. Army Battle Command System (ABCS), providing synchronization of dispersed forces and resulting in increased lethality and survivability. The RFPI ACTD will demonstrate a highly lethal, survivable, and rapid, air-deployable enhancement to the Early Entry Task Force. The RFPI ACTD will leave behind sensors (hunters) including Hunter, Remote Sentry, FO/FAC and acoustic arrays; C3 as part of ABCS; and weapons (killers) including EFOG-M, HIMARS and Automated 105mm Howitzer.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
603004A/DL95	3.0	2.2	2.5	4.8	5.5	0
603004A/D43A	10.4	12.2	10.3	10.6	0	0
603005A/D440	0.8	0	0	0	0	0
603313A/D486	5.9	8.1	8.7	5.3	0	0
603313A/D380	3.8	5.7	9.0	7.1	14.4	0
603313A/D493	18.0	24.8	30.8	28.9	14.2	0
603313A/D496	69.4	58.6	53.3	23.8	9.0	0
603710A/DK86	2.5	2.7	2.8	0	0	0
603710A/DK87	0	0	1.5	2.4	0	0
603710A/DK70	13.5	11.7	0	0	0	0
603772A/D101	2.0	4.0	3.0	0	0	0
603635M	3.8	5.0	3.4	0	0	0
602303A/A214	1.5	0.5	0.6	0	0	0
603750D/ACTD	9.0	9.7	0.3	5.0	5.3	0
Total	**143.6**	**145.2**	**126.2**	**87.9**	**48.4**	**0**

B.03. Precision SIGINT Targeting System ACTD. The Precision SIGINT Targeting System (PSTS) is a Joint Service and Defense Agency effort to develop and demonstrate a near-real time, precision targeting, sensor-to-shooter capability using existing national and tactical assets. PSTS will provide tactical users with an order of magnitude performance improvement over current capabilities for precision geolocation of targets. Principal tactical application for PSTS information includes support for precision weapon systems, search and rescue operations, special forces operations, land warfare, and amphibious assaults. This AC TD will leave behind new software and processing technology as well as the new operational concept that will allow coordinated utilization of existing assets for more effective operation.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
603794N/R2234	11.0	13.2	8.7			
Total	11.0	13.2	8.7			

B.04. Survivable Armed Reconnaissance on the Digital Battlefield (SARDB). This candidate ACTD will demonstrate in FY99 improved linkages, tactics, techniques, and procedures among early entry joint surveillance and manned/unmanned reconnaissance assets. Trade-off analyses supported by live, virtual, and constructive simulation will optimize the combined effects of unmanned aerial vehicles (UAVs), armed reconnaissance rotorcraft, and attack helicopters.

This program is required by the Comanche Program Acquisition Decision Memorandum. Technologies and programs to be leveraged include: Rotorcraft Pilots Associate ATD, Battlespace Awareness Data Distribution ACTD, Rapid Battlespace Visualization ACTD, Combat Identification ACTD, Army Force XXI Digitization and Advanced Warfighting Experiment, Rapid Force Projection Initiative ACTD, and Joint Precision Strike. In addition to improving power projection, improving the ability of our early entry forces to establish and expand the battlespace and demonstrating the synergistic benefits of coupling manned and unmanned reconnaissance assets, this program is timed to facilitate insertion of a pilot associate, C4I, and RSTA software upgrades to the Comanche armed reconnaissance helicopter.

Service/Agency POC:

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0603238A/D177		18.1	17.9	22.6	0	0
Total		**18.1**	**17.9**	**22.6**	**0**	**0**

Note: Possible FY97 Status

C. COMBAT IDENTIFICATION

C.01 Battlefield Combat Identification (BCID) ATD

C.02 Combat Identification (CID) ACTD

C.03 Advanced Identification ATD

C.04 Enhanced Recognition and Sensing Ladar (ERASER) ATD

C.05 Position Location and Identification (PLAID) ATD

C.06 Specific Emitter Identification

C.07 Precision Identification/Engagement ACTD (Proposed)

C.01. Battlefield Combat Identification (BCID) ATD. This ATD is aimed at solving the combat identification (ID) problem underscored by the lessons learned from Operation Desert Storm. The ATD provides the Army's technology options for the joint combat ID air-to-ground and ground-to-ground ACTD. Efforts in this ATD build upon the BCIS near-team solution, presently being developed for vehicle platforms (a millimeter-wave question-and-answer type, target ID system), and validate the architecture for a comprehensive air-to-ground and ground-to-ground, BCIS-compatible system including the dismounted soldier. Battle Lab Warfighting Experiments (BLWEs) in FY95 assessed requirements and several concepts for the dismounted soldier. BLWES in FY96 provide the foundation for a joint ACTD and several concepts for integrated air-to-ground and ground-to-ground applications including situational awareness through the gunner's sight. Probability of correct ID of friendly platforms will be increased from 90 percent (BCIS baseline) to 99 percent at 1.5 times the effective range of the weapon, and position location accuracy of 100 meters or better will be demonstrated. In FY97, demonstrate enhanced BCIS digital data link on combat vehicle platforms in conjunction with the Task Force XXI field exercise and combat ID for air-to-ground operations. In FY98, as part of the Digitized Division exercise, demonstrate advanced concepts for enhanced ID which leverage target acquisition sensors. Reduction of target ID timelines by at least a factor of 3 will be demonstrated. Also in FY98, demonstrate miniaturized hardware for the dismounted soldier as part of the 21st Century Land Warrior effort.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
63772A/D281	6.8	7.1	3.4	0	0	0
Total	**6.8**	**7.1**	**3.4**	**0**	**0**	**0**

Note: This is the same PE and project used in C02, the Joint Combat Identification ACTD. The BCID ATD supports the ACTD.

C.02. Combat Identification (CID) ACTD. The CID ACTD is designed to assess technology concepts that could potentially provide an affordable, effective air-to-ground combat identification capability that is interoperable with the current Battlefield Combat Identification System (BCIS) ground-to-ground solution or other ground-to-ground system concepts. The ACTD has been built upon the architecture framework resulting from the DoD Combat Identification Task Force conducted under the auspices of the Assistant Secretary of Defense, Command, Control, Communications, and Intelligence. The ACTD is aimed at increasing combat effectiveness while reducing fratricide. A series of technical and operational exercises are planned to quantify key parameters such as probability of correct identification, time to identification, range of identification, spatial discrimination, and system capacity (in terms of user density) for the various concept alternatives. Two operational warfighting exercises in FY97 will be used to measure operational capabilities. A minimum probability of correct identification of 0.90 will be demonstrated for an interoperable air-to-ground and ground-to-ground combat identification capability. Also, identification will be demonstrated effectively at 1.5 times the effective range of the weapon. Further, it is intended to provide the user an operational capability, the means to evaluate the potential new capability in terms of its military utility, and a sound basis for adapting his warfighting concept of operation to maximize effectiveness of the new capability.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0602120A/M&S	2.3	1.0	0	0	0	0
0604817A/BCIS	29.5	8.8	1.2	.6	0	0
0603772A/CID TECH	5.4	4.4	0	0	0	0
0605013N/SABER	0	0	0	0	0	0
0603742F/ID TECH	3.6	2.7	0	0	0	0
0603750D/OSD ACTD	17.5	16.4	4.0	4.0	0	0
Total	**58.3**	**33.3**	**5.2**	**4.6**	**0**	**0**

Note: the ACTD also includes hardware funded under non-S&T Pes, including the Army Battlefield Combat ID System, Navy SABER project, and Air Force SADL project.

C.03. Advanced Identification ATD. The objective of this ATD is to develop and demonstrate advanced Combat Identification capability for use on current and next generation aircraft. ATR technology aimed at identifying both air and ground targets will be developed. This ATD will leverage the investment already made in two programs. For air targets, multi-sensor/multi-feature fusion algorithm development will be examined by the Air Target Algorithm Development (ATAD) program, and the MSTAR Model-Driven ATR program will examine model-driven ATR issues for ground targets. The approach for this ATD encompasses three phases. Phase I will demonstrate a feature-based fusion algorithm for air targets on current aircraft. This flight demonstration will begin in FY98. Phase II will be a FY98 demonstration of the model-driven Combat ID technology for ground targets. Finally, Phase III will demonstrate in FY02 a feature-based capability for air targets on next generation aircraft.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
63203F/09DF	0.6	1.4	1.7	2.4	3.6	3.6
Total	**0.6**	**1.4**	**1.7**	**2.4**	**3.6**	**3.6**

C.04. Enhanced Recognition and Sensing Ladar (ERASER) ATD. This program is aimed at improving the airborne identification process for both air and ground targets through the use of active laser technologies. ERASER supplied target identification will complement other sources of ID from the fighter's total target ID suite. Efforts for this program will concentrate on enhancing the capabilities of the LANTIRN targeting pod through the incorporation of advanced laser and signal processing into the existing pod. ERASER will incorporate technology and two-dimensional algorithms developed for ground target identification, while ATR concepts from one-dimensional radar technology will be adapted to laser wavelengths for air target ID. Evaluations in FY96 assess current ID capability and define ERASER requirements to complement these capabilities. In FY97, flight test hardware development will be initiated, leading to preliminary and critical design reviews in FY98 and FY99, respectively. Rooftop demonstration of the ERASER technology is to be accomplished in FY00 with flight testing in FY02.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
63203F/69DF	0.3	0.3	1.3	2.7	3.3	3.0
Total	**0.3**	**0.3**	**1.3**	**2.7**	**3.3**	**3.0**

C.05. Position Location and Identification (PLAID) ATD. The Air Force considers PLAID to be a sensitive effort. For further information, contact:

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C.06. Specific Emitter Identification. Specific Emitter Identification (SEI) technology enables passive identification (ID) of platforms that emit RF signals and so enhances ocean surveillance and combat ID capabilities. At present, both coastal and open-ocean surveillance operations are being conducted using SEI equipment. This includes monitoring maritime shipping in support of embargo enforcement (interdiction of drug traffic and other prohibited cargo) and tracking the movement of military assets. Currently 17 SEI units have been developed and installed on operational P-3 and ES-3 aircraft, surface ships, submarines, and on land sites. An additional 32 units are planned for the near future.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
602270N	1.0	0.8	0.9	0.9	1.0	1.0
603270N	0.9	1.0	0.7	0.4	0.4	0.4
Total	**1.9**	**1.8**	**1.6**	**1.3**	**1.4**	**1.4**

C.07. Precision Identification/Engagement ACTD (Candidate). The Radiant Outlaw ATD has demonstrated reliable ID against ship targets using both shape and micro-doppler (vibration) processing. Field measures of ground targets show significant promise for ground vehicles as well. The operational objective is to evaluate effectiveness improvement of maritime surveillance aircraft provided by onboard long range ID. The technical objective is to demo long-range precision ID of a broad class of surface and ground targets. The ACTD is proposed for an FY97 start. Operational demonstration of the Radiant Outlaw II FLIR will occur in FY97; demonstration of the radiant outlaw radar will occur in FY99.

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Programmed DTO Funding ($K): (Estimate being updated.)

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0603792N	2.4	1.0	1.0	1.0	0.0	0.0
Total	**2.4**	**1.0**	**1.0**	**1.0**	**0.0**	**0.0**

D. JOINT THEATER MISSILE DEFENSE

D.01. Navy Upper Tier LEAP Interceptor Control System [Solid Divert and Attitude Control System (DACS)].

Narrative—Solid divert propulsion is considered a requirement for operational shipboard applications. Solid divert systems are inherently easier to store and handle, and should meet insensitive munitions requirements. Tactical divert propulsion systems will be required to provide up to 5 g's of acceleration (possibly higher) during endgame engagements for terminal aimpoint selection. Burn time requirements may vary between 30-60 seconds for some engagements. To achieve a design that has long burn times and on-demand high acceleration capability, a multiple pulse grain will have to be employed.

Justification/Rationale—A prototype system was successfully tested during the BMDO/Navy Terrier LEAP Technology Demonstration Program with short burn time (~15 seconds) and low thrust (35 lbs). This system was demonstrated in two hover tests. A Theater Wide or Upper Tier interceptor divert system will require longer burn times and higher thrust than this prototype unit. A 200-lb diverter valve was static tested in November 1993 under Thiokol IR&D funding. This thruster uses a scaled-up version of the fluidic valves that were demonstrated in the prototype system. The Thiokol fluidic valve concept requires the use of high strength/high temperature materials which are very hard to manufacture. Recognizing the manufacturing process challenges and the need to provide a competitive environment, BMDO initiated an alternate solid DACS program. To date, the effort has successfully demonstrated a prototype of the poppet valve concept. Development, hover, and flight testing as well as shipboard qualification of these designs will be necessary to ensure the deployment of a safe and effective missile round.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
603868C/1270	8.1	12.0	15.0	6.0		
Total	**8.1**	**12.0**	**15.0**	**6.0**		

D.02. Integrated Sensor/Data Fusion Demonstration. In anticipation of future requirements for more sophisticated surveillance sensors for theater missile defense, BMDO is supporting an Advanced Sensor Technology Program (ASTP) and Integrated Sensor/Data Fusion Development. The principal objective of this program is technology development culminating in airborne surveillance demonstrations of a multispectral sensor suite consisting of a radar, IR sensor, and laser radar. Individual sensor data streams will be fused in real time to provide all-weather day/night capabilities. The goal is to demonstrate fused-sensor technology improvements for timely, long-range missile launch detection/warning and missile defense cueing, precise tracking for impact point prediction, launch point estimation, target identification and discrimination, and interceptor fire control functional support.

The technologies that are being pursued are multiple quantum well (MQW) focal plane arrays, smart focal plane arrays, eyesafe ladar, wide angle search radar for covert all-weather theater ballistic missile (TBM) booster surveillance, and tracking and discrimination data fusion algorithms. Both the ASTP and the Integrated Sensor Fusion programs will develop and demonstrate these technologies in laboratory and ground tests prior to an airborne technology demonstration.

Demonstrations—Ground test demonstration of multiple sensor data fusion capability using fault-tolerant neural network image processors will take place in 1998. The first airborne demonstration has been scheduled for FY 2000. The fused sensor suite will be used to observe targets of opportunity consisting of theater and strategic ballistic missile targets. Additionally, it will perform launch detection/warning, interceptor and other defense cueing, precise tracking, impact point prediction, launch point estimation, and discrimination.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
603173C/1161	3.1	4.9	4.8	4.6	4.7	4.0
603173C/1651	2.0	3.0	3.0	2.0	0.0	0.0
Total	**5.1**	**7.9**	**7.8**	**6.6**	**4.7**	**4.0**

D.03. Advanced Discriminating Interceptor. Ballistic missile defense (BMD) interceptors must discriminate between real targets and other objects such as decoys and debris for effectiveness in an ECM environment, or against reentry vehicles accompanied by decoys. An interceptor employing these technologies used in an architecture including ground-based radar and space-based infrared satellites, can protect U.S. cities from ballistic missile attack and protect our fighting forces from theater ballistic missiles. Simulation results show that depending upon the attack scenario, the single shot kill probability increases by as much as a factor of 9 after addition of advanced interceptor discrimination capability (i.e., P_k increases from 0.1 to 0.9). An interceptor mass growth of 25 percent will occur and the interceptor alone will be more expensive than without advanced discrimination. However, the system cost will decrease because of a reduction in number of required interceptors. Instead of shooting two or three interceptors at each target to meet the system effectiveness requirements, only one shot will be needed.

The technologies necessary for interceptor discrimination are: lightweight laser radar, simultaneous multispectral LWIR focal plane arrays, highly uniform focal plane arrays, and data fusion techniques to combine the outputs of active and passive sensors. The Advanced Discriminating Interceptor Program will develop and demonstrate these technologies in lab tests and low cost interceptor flight tests. Systems benefiting from this technology are the Exoatmospheric Kill Vehicle, THAAD, CORPS SAM, and the Navy Theater Wide Interceptor.

Demonstrations—The first discriminating interceptor demo will take place in FY01. It will take advantage of the fly-along bus in a BMD core program test. Additional tests are planned in FY02 and FY03. The first test will observe the target, decoys, and debris and perform real-time discrimination between them. One or both of the later tests may employ the discriminating seeker as the primary interceptor seeker.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
603173C/1161	0.5	0.9	0.9	0.9	0.8	0.7
603173C/1270	12.7	14.0	14.4	15.3	15.4	20.9
Total	**13.2**	**14.9**	**15.3**	**16.2**	**16.2**	**21.6**

D.04. Advanced X-Band Radar Demonstration.

Narrative—By 2000, demonstrate a five-fold increase in output power of solid-state transmit/receive (SS T/R) microwave monolithic integrated circuits (MMICs) which operate at 10 Ghz (X-band). Current Gallium Arsenide (GaAs) based MMIC technology provides approximately 10 watts peak output power. This output power can be dramatically increased using advanced GaAs designs such as metal semiconductor field effect transistors (FETs), pseudomorphic high-electron mobility FETs, heterogeneous FETs, and wide bandgap devices. Advanced MMIC module packaging technologies such as "stack module" designs can reduce the overall occupied volume of the MMIC T/R modules. This improves the efficiency of the device and its manufacturability. The modules improve the transportability of the system which utilizes the MMIC chips.

Justification/Rationale—The various MMIC technologies are targeted for use in the Theater High Altitude Area Defense (THAAD) radar and the National Missile Defense Ground Based Radar (NMD GBR), which are both X-band multi-element radars. Advanced SS T/R modules for the THAAD and NMD-GBR radars will improve their target detection capabilities by roughly a factor of two, allow them to discriminate various threats from one another by improving their sensitivities by a factor of five, and allow them to operate in a "burn-through" mode to overcome jamming and radio frequency interference. The Army's PEO Missile Defense is the supporting customer.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
602173C/1651	3.7	4.2	4.5	4.5	4.5	4.0
602173C/1161	0.2	5.5	7.5	10.5	10.4	8.2
Total	**3.9**	**9.7**	**12.0**	**15.0**	**14.9**	**12.2**

D.05. Advanced Space Surveillance.

Objective—Integrate the most advanced satellite technologies into a flight demonstration platform that can perform precision surveillance, acquisition, and tracking from space of future sophisticated ballistic missile targets. (Demo in 2003)

Advanced Technologies Required—This technology objective seeks to exploit the latest advances in remote sensing and imaging, onboard processing and data fusion, communications, satellite power generation, propulsion, and structural materials. The following examples are illustrative of the research and development programs being pursued to accomplish this objective:

(1) Multi-Mode Sensors—Advanced materials and growth techniques will enable integrated focal plane arrays made from gallium arsenide and other III-V semiconductors to detect targets in many infrared bands simultaneously. Wide band-gap materials will be used to create sensors with sensitivity in the ultraviolet spectrum.

(2) Multi-Sensor Data Fusion—Onboard fusion/processing of multiple sensor data types utilizing advanced computational hardware, hardware configurations, and software (algorithms).

(3) Communications—High-temperature superconductors will provide the frequency response to enable spread-spectrum, code-division, multiple-access broadcast mode communications. Laser communications will provide point-to-point communications at greater than 10 gigabits per second.

(4) Photovoltaic Arrays—Advanced multi-land semiconductor materials such as gallium antimonide coupled with novel solar concentrators will provide conversion efficiencies approaching 30 percent at reduced weight and size with extended lifetimes.

(5) Electric Propulsion Engines—Plasma thrusters based on the Hall Effect will provide prolonged life of the maneuverable satellite, enabling orbital maintenance and transfer, at specific impulses exceeding 1600 seconds, simultaneously allowing for reductions in system mass.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
603173C/1161	11.7	16.8	17.3	18.1	20.2	16.7
602173C/1651	6.0	7.0	7.5	7.5	7.0	7.0
Total	**17.7**	**23.8**	**24.8**	**25.6**	**27.2**	**23.7**

D.06. Cruise Missile Defense (CMD) Phase II ACTD. The joint Army-Navy CMD Phase I (also called Mountain Top) ACTD was the first demonstration of a new capability for over-the-horizon (OTH) tracking and engagement of low flying targets through the use of an elevated sensor suite which works in cooperation with surface-based air defense systems, such as an AEGIS cruiser or PATRIOT fire unit.

A suitable architecture for defense against cruise missiles was recommended by the 1993 Deployable Air Defense Study sponsored jointly by DUSD(AT), BMDO, and ARPA, and endorsed by the 1994 DSB Summer Study Task Force on Cruise Missile Defense. Both recommended new airborne surveillance and fire control radars to enable SAMs to engage beyond the line-of-sight of their organic surface-based radars, and to provide precision cueing to fighters to maintain their capability against advanced CM threats. These sensors could be carried in both fixed-wing and aerostat platforms. These assets would be integrated into an overall joint theater air defense system-of-systems.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
TBD	TBD	TBD	TBD	TBD	TBD	TBD
Total						

D.07. Aerostats for Cruise Missile Defense (CMD). The intent of the Aerostat program is to field a limited operational capability by 2001. As currently planned, three large "strategic" and possibly one smaller "tactical" system would be left behind as residual systems following completion of system demonstrations on three areas: (1) development of a larger aerostat (nominally 91M) than the 71M aerostats which exist today; (2) aerostat deployability, handling, and availability; and (3) lightweight sensors. The overall objective is to provide a long duration elevated sensor system capable of disseminating high quality surveillance and fire control data to existing and future planned weapon systems operated by all the Services. The goal is to provide a robust capability over both land and sea in a littoral environment and to be capable against future advanced threats.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0102419A	13.0	40.0	110.0	140.0	115.0	120.0
Total	**13.0**	**40.0**	**110.0**	**140.0**	**115.0**	**120.0**

E. MILITARY OPERATIONS IN URBAN TERRAIN (MOUT)

E.01 MOUT Command, Control, Communications, Computers, and Intelligence (C4I)

E.02 MOUT Survivability

E.03 MOUT Engagement

E.04 MOUT Modeling and Simulation

E.05 MOUT ACTD (Proposed)

E.01. MOUT Command, Control, Communications, Computers, and Intelligence (C4I). The goal is to demonstrate robust, scaleable C4I and advanced sensor capabilities which provide commanders and warfighters with seamless, non-hierarchical adaptive networks for multimedia communications in a highly dynamic MOUT environment. Evolve an integrated communications infrastructure that leverages commercial protocols, formats, waveforms, and standards to achieve global tri-Service interoperability through integration of mobile IP tactical networks into global infrastructure. Demonstrate near real-time vertical and horizontal C2 from the battalion down to individual combatant to facilitate increased command tempo, control, and intelligence while also enhancing maneuverability in urban terrain.

By FY00, under the rubric of **Small Unit Operations** (and in support of Army Force XXI and Marine Corps Sea Dragon initiatives), provide comprehensive awareness, tasking, tools, and information for tactical level combatants, broadcasting 75 percent of all relevant information to all network nodes, to very quickly assess and select alternative courses of action at the Bn level and below. Develop capability for a scaleable database and fusing, filtering, and dissemination technologies to ensure 100 percent of essential information is distributed to appropriate elements within small units. Develop and demonstrate real-time planning, tasking, retasking, and control for ground and unmanned air vehicles. Develop wireless communications providing voice, data, video, and graphics (operating in a severe multi-path environment), integrated with **geolocation and navigation technologies** capable of <3 meter location accuracy which operate reliably in built-up environments with legacy systems. Develop, demonstrate, and integrate a precision clock to provide precision geolocation and navigation for comprehensive situational awareness.

Leverage and apply multiple advanced sensor technology programs to provide a family of common modular electro-optical and radar sensors for unmanned vehicles to address the areas of overhead, wide area surveillance, unmanned ground vehicle surveillance, and mine/explosive ordnance detection. By FY98, demonstrate a head-mounted 320 x 240 uncooled thermal sensor with electronically coupled display.

By FY00, develop an internetted and arrayed advanced sensor capability, dynamically linked with the situational Awareness and Tasking capability, to extend the tactical local area awareness and provide a flexible, precision targeting capability integrated into the communication and geolocation architecture. Incorporate internetted and arrayed processing of distributed and dispersed sensors to provide targeting and real-time information on targets and activities. Integrate precision geolocation, registration, and self-positioning capability of tactical operational assets on the battlefield.

By FY01, integrate weapons/fire location processing and demonstrate capability to detect and accurately locate hostile artillery/mortar/sniper fire.

By FY97, demonstrate the integration of risk-mitigating technology upgrades to the dismounted **21st Century Land Warrior** to include: wireless video/data interfacing to existing weapon sensors; high resolution (1000 line) miniature display integrated with **advanced image intensifier (AI2)**; integrated helmet antenna for warfighter radio; voice input for control of computer/radio; **Forward Observer/Forward Air Controller (FO/FAC)** reconnaissance/target hand-off system; (electronics miniaturization) integration including multi-chip module technologies; self-contained navigation; power management processes/software; and laser-based warfighter-to-warfighter combat identification. By FY97, develop and demonstrate an advanced lightweight protective communications helmet, and improved TV and radio broadcast antenna systems for SOF. By FY99, demonstrate integration of additional technology upgrades to the 21st Century Land Warrior in the areas of integrated sight; wireless video/data interfacing to integrated sight, Javelin, **and objective individual combat weapon (OICW)**; personal status monitoring (PSM); improved radio technology including higher data rates and packet relay protocol; indirect view warfighter imaging system including image enhanced night vision and high resolution helmet-mounted display; rapid target acquisition; further electronics miniaturization including micro-electrical mechanical systems; power management; and alternate power sources including fuel cells.

Technology barriers include: integrated, self-contained, miniaturized navigation technologies; enhanced systems packaging technologies; and robust situational awareness presentation techniques.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0603226E/EE-51	18.7	52.7	51.6	38.4	26.3	
0602301E/TT-04	8.4					
0603702E/ST-11	3.5					
0603640M/C2223	1.0	1.0				
0602784A/A855	0.6	0.6				
0603001A/DJ50	12.5	16.2	6.3	7.0	0	0
060402BB/S200	0.4	0.5	0.1			
Total	**45.1**	**71.0**	**58.0**	**45.4**	**26.3**	**0**

E.02 MOUT Survivability. The goal is to enhance the survivability of forces operating in urban environments through improvements in ballistic protection, countersurveillance, combat identification, and counter-sniper and individual medical technologies. Specific demonstrated capabilities for **small arms protection for the individual soldier**: by FY98, demonstrate an advanced material system for protecting the MOUT warrior against fragmentation and small arms threats (known ball sniper rounds) to be measured by a 20 to 30 percent reduction in areal density over current small arms protection without significantly increasing other penalties (bulk, cost, etc.).

Specific demonstrated capabilities for **ultra-light ballistically resistant materials** are as follows: by FY97, correlate the relevant materials' dynamic properties and response to improvements in ballistic resistance; and by FY99, demonstrate ballistic performance and dynamic response of optimal ultra-lightweight armor materials.

Specific demonstrated capabilities for **thermal signature reduction for the individual combat soldier**: by FY97, prototype and demonstrate emerging signature reduction and anti-detection technologies for SOF application. By FY98, demonstrate the ability to develop and deploy camouflage, including MOUT site specific (visual and near-infrared) uniforms within a 60-day time frame; by FY99, demonstrate combat uniform systems that reduce the individual's thermal signature to blend with 50 percent of the typical urban environments.

By FY98, demonstrate a prototype warfighter-to-warfighter combat ID system, embedded in the warfighter system, with a 99 percent probability of identifying friendly equipped soldiers in the MOUT environment out to ranges of 2000 meters. By FY99, prototype and demonstrate **miniaturized and integrated combat ID** systems for air-to-warfighter, vehicle-to-warfighter, and warfighter-to-vehicle applications. By FY98, demonstrate acoustic, IR, and multisensor technologies integrated into a counter-sniper capability which accurately detects and locates small arms fire in built-up areas in near-real-time.

In medical technologies, the use of a small unit telemedicine net with enhanced communication links in conjunction with the PSM will allow quick communication and aid delivery to the wounded. By FY02, identify soldier casualty status and performance capability by remote interrogation of body worn sensors or personal status monitor (PSM).

Technical barriers include affordable, lightweight, high performance ballistic protective materials; lightweight multispectral camouflage technology integrated into flexible, textile materials; RF antenna and millimeter wave component miniaturization; RF signal transmission and processing; miniaturized computer display; encryption algorithms; acoustic, IR, and multisensor technologies.

These technologies will benefit emerging systems as well as fielded systems to include: 21CLW, Land Warrior, Modular Body Armor, and Advanced Battledress Uniforms.

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Programmed DTO Funding ($M):

Program Element	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03
0602712E	3.2	3.2	4.2					
0602702E	2.6							
0603226E/EE-XX		2.8	3.0					
060402BB/S200	0.2							
0602105A/AH84	0.8	0.9	0.8	0.8				
0602786A/AH98	2.8	1.8	1.4	0.4				
Total	**9.6**	**8.7**	**9.4**	**1.2**				

E.03. MOUT Engagement. Demonstrate individual combat weapon systems that significantly augment joint service lethality against hard and soft targets in a MOUT environment via the integration of revolutionary weapon, fire control, ammunition, and fuzing technologies; develop and demonstrate anti-personnel and anti-material non-lethal devices/munitions/weapons. Future weaponry will exploit modular fire control systems, air-bursting lethality mechanisms, advanced materials, and shoulder-fired warheads, and will seamlessly link with the individual warfighter and C4I systems in accordance with the Joint Service Small Arms Master Plan (JSSAP) and 21CLW initiatives.

Specific demonstrated capabilities for the **objective individual combat weapon (OICW)** include: in FY99, a 50 percent probability of incapacitation to 300 meters. Specific demonstrated capabilities include: advanced opto-electronic video sighting; target tracking/detection and computerized aimpoint displacement; precision laser range finding; modularized thermal sighting; wireless video and data linkage compatibility; electronic target handoff potential; remote firing potential; precision strikes from within enclosures; and incapacitation against defilade targets. Specific demonstrated capabilities for the **multi-purpose individual munition (MPIM)** include: by FY97, advanced warhead propulsion firing in an enclosure with a carry weight as close as possible to 12 lbs. Specific demonstrated capabilities for SOF include: by FY96, demonstrate an advanced sniper weapon fire control to give a full wind vector ballistic solution at ranges of up to 1200 meters.

Milestones for non-lethal capabilities include: by FY97, demonstrate a family of non-penetrating, anti-personnel blunt impact munitions which are launchable from existing warfighter weapon platforms (e.g., M16A2, 40mm M203 grenade launcher, 12 gauge shotguns) for direct-fire use against both point and crowd targets at ranges of 10 to 100 meters. By FY97, develop and demonstrate pre-emplaced non-lethal anti-materiel vehicle stoppers capable of stopping a wheeled vehicle moving at 40 mph with minimal danger to personnel and minimum damage to the vehicle. By FY97, demonstrate a remote-activated vehicle arresting barrier and an electronic injection vehicle stopper. By FY99, demonstrate an electromagnetic pulse vehicle stopper. By FY97, develop and demonstrate for SOF a handheld detector capable of determining the density and thickness of walls before breaching.

Technical barriers include: accurate laser ranging, efficient fragmentation and weight minimization; the non-existence of tunable (lethality selectable) non-lethal weapons/munitions; weight minimization and safety certainty when firing from an enclosure; and limited bio-effects data for quantifying the potential personnel effects of the vehicle stoppers.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03
0602624A/AH19	4.2	4.0	3.0					
0603607A/D627	3.9	2.0	3.4	3.0				
0603640M/C2223	0.5	1.1	1.2	0.6				
0603122D/P484	0.4							
060402BB/S200	0.3	0.5	0.1					
0603313A/D387	4.5	0.8						
Total	**13.8**	**8.4**	**7.7**	**3.6**				

E.04. MOUT Modeling and Simulation. The goal is to use modeling, simulation, and analysis to enhance MOUT training and mission rehearsal, evaluate manpower and personnel integration, refine operational concepts, and evaluate command and control. By FY99, complete advancements in simulation to evaluate the combat effectiveness of MOUT systems using virtual environments, e.g., the tactical training engagement simulator and man-in-the-loop simulator. By FY00 (given analysis results of FY98-99), develop final measures of effectiveness/performance to evaluate the contributions of novel MOUT capabilities to the light force.

Technical barriers include: developing synthetic environments that are acceptable reproductions of the real combat environments; and creating computer-generated forces that accurately depict combat behaviors.

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Programmed DTO Funding ($M):

Program Element	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03
0603640M/C2223	1.0	2.0	1.0					
Total	**1.0**	**2.0**	**1.0**					

E.05. MOUT ACTD (Proposed). The goal is to demonstrate a full-spectrum, robust MOUT operational capability for battalion and below that seamlessly integrates and aggregates the "products" of the MOUT C4I, Survivability, Engagement and Modeling & Simulation efforts previously demonstrated (DTOs E.01-E.04).

By FY00, complete the integration of the MOUT system of systems and conduct joint field exercises with SOF, Marine, and soldier participation. Demonstrations will include tactically realistic scenarios which will stress individual and small unit performance in stressful MOUT environments to assess the operational interoperability of the MOUT system of systems. M&S will be used to facilitate mission planning and rehearsal, and augment quantification of performance enhancements. Minimum goals include: 50 percent increase in situational awareness at all levels; and 20 percent increase in force survivability.

Technical barriers include: hardware/software interoperability; robust situational awareness; and fusing/filtering/dissemination of information.

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Programmed DTO Funding ($M):

Program Element	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03
0603001A/D393			20.3	21.2	21.0			
Total			**20.3**	**21.2**	**21.0**			

F. JOINT READINESS

F.01. Synthetic Theater of War ACTD.

Goal: Improve the conduct of joint training and provide simulation-driven mission rehearsal capability. Improve the quality of simulations by developing representations of: combat actions resolved at the weapon system level, command and control behaviors, and high-resolution dynamic environments that include tactically significant environmental effects. Improve simulation training effectiveness and flexibility by interfacing simulations with operational C4I systems and by integrating distributed live, virtual, and constructive simulations. Reduce the overhead cost of simulation by developing knowledge-based semi-autonomous forces, faster database builds, and improved information transfer among distributed participants. Improve after action analytic tools and develop effective methods for exercise generation and control.

In FY96, develop object-oriented synthetic forces simulation (OpenSAF), compliant with the High-Level Architecture. Demonstrate command forces (CFOR) for all four Services at company level or equivalent. Demonstrate dynamic synthetic environments that incorporate battlefield obscurants, multistate objects, and weather. Integrate dynamic encryption devices for distributed simulation exercises. Refine the application control and multicast grouping techniques developed for STO-Europe experiment and integrate into the runtime infrastructure (RTI) prototype being developed jointly with DMSO for use by the DoD M&S Architectural Management Group (AMB) as well as STOW.

In FY97, demonstrate OpenSAF scaleability using parallel processor computers to increase by 5X the numbers of entities per workstation. Extend CFOR to battalion level or equivalent in all Services. Develop intelligent synthetic forces platforms for rotary winged, fixed winged, ships, and individual combatants. Implement new standardized representations of synthetic environment databases. Optimize the terrain representations for triangulated irregular networks and for large geographic regions. Demonstrate key agile encryption systems and dynamic multicasting software and hardware to support large numbers (thousands) of multicast groups. Develop prototype scenario generation and distributed exercise control technologies.

In FY98, demonstrate the STOW simulation operational prototype. This will occur during USACOMs United Endeavor exercise in November 1997, and will comprise both joint training and mision rehearsal excursions. Provide continued systems maintanence and enhancements. During FY99 through FY01, continue technology development in support of the JSIMS and JWARS development.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
063226E/EE37	57.6	48.4	42.3	44.7	62.9	65.3
063226E/EE46	26.9	39.7	3.0			
Total	**84.5**	**88.1**	**45.3**	**44.7**	**62.9**	**65.3**

F.02. Advanced Joint Planning ACTD.

GOAL: Provide U.S. Atlantic Command (USACOM), Joint Staff (JS), and other CINCs with an increased ability to rapidly plan, package, and deploy forces to multiple regional conflicts. The AJP ACTD will develop, demonstrate, harden, and leave in place an enhanced command, control, communications, and computer (C4) planning capability. The program focuses on three primary areas: (1) force readiness and deployment planning, (2) force employment planning, and (3) force rehearsal and evaluation. The program will adapt the technologies developed by the Joint Task Force Advanced Technology Demonstration (JTF ATD) (e.g., architecture, application, servers, and schema), the Common Operational Modeling, Planning, and Simulation Strategy (COMPASS), and other DARPA initiatives for configuration into USACOMs C4 environment. These emerging C4 software tools will be tailored to primary areas of application, then integrated, employing a CONOPS which will be developed as a part of this program. Close interaction between the developers, sustainers, and users will enhance the utility and transition of resulting capability. This new functionality will provide a supported, leave-behind capability at USACOM before being transitioned through the DISA Global Command and Control System (GCCS) Leading Edge Services (LES) into the CCCS core service for application with other users.

The implementation phase (FY94-97) focused on readiness and deployment analysis, force employment planning, and force rehearsal and evaluation initiatives. During the support phase (FY97-98) this effort will transition to the GCCS LES subsequent to a period of leave-behind maintenance support for readiness and deployment analysis, force employment planning, and force rehearsal and evaluation tools. Overall performance goals are to reduce CINC planning cycles from weeks to days or hours for crises and from several weeks to less than a week for major deployments. The warfighter will be afforded a set of user-defined, key automated planning functions providing rapid visibility to readiness, needed tools for force deployment, and employment planning and rehearsal and evaluation.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
063226E	12.9	9.0	1.3	0.0	0.0	0.0
Total	**12.9**	**9.0**	**1.3**	**0.0**	**0.0**	**0.0**

F.03. Advanced Distributed Simulation DTO.

GOAL: Develop advanced M&S tools and synthetic environments that offer more effective and less resource intensive means of enhancing joint readiness. M&S can substantially contribute to improving the joint readiness in the areas of—(1) training, (2) modernization, (3) force tailoring, and (4) logistics planning.

M&S has the potential for supporting cost-effective joint and combined training involving active and reserve forces, multiple echelons, and computer-generated simulations of large-scale forces (friendly, neutral, and hostile) on a synthetic battlefield. Military planners and warfighters will be able to rehearse missions jointly in credible synthetic environments. Prior experience (e.g., the use of M&S in Desert Shield) suggests that the use of synthetic environments can increase the probability of mission success by analyzing the mission plans for effectiveness and by fostering familiarity and proficiency with the mission plan, enemy order of battle, and environmental features (terrain, oceans, atmosphere, and space). Representations of proposed systems (virtual prototypes) can be used to support acquisition process activities subsuming concept exploration, engineering, manufacturing, and follow-on support activities (e.g., training, maintenance, etc.), thus reducing time, resources, and risk. Using M&S, the effectiveness of different force structures can be examined in a wide variety of mission scenarios, both conventional and operations other than war. High-fidelity models of logistics will be integrated with combat models to allow a comprehensive analysis of the sustainability of the joint forces.

The major technical challenges include: (1) establishing the architectural design, time management services, protocols and standards, and multi-level security for the interoperability of simulations; (2) providing the maximum possible interoperability among simulations at different levels of resolution with live C4I systems; (3) developing coherent, complete, and consistent conceptual models of the mission space (CMMS) is an abstraction of the Joint Mission Essential Tasks List that serves as a frame of reference for simulation development; (4) developing a capability to rapidly generate highly interactive representations of terrain, the ocean, the atmosphere, and space that span large and diverse regions and account for significant conditions and effects; (5) development of system representations of varying granularity; and (6) the representation of human behavior that must reflect *variable* human capabilities, cognitive processes, limitations, and conditions that influence behavior (e.g., morale, stress, fatigue).

By FY96, prototype and demonstrate a high level simulation architecture (HLA) and a run time infrastructure (RTI), begin development of techniques for modeling complex data (completed FY00). In FY97, an enhanced version of HLA and RTI prototypes will be tested, initial version of CMMS, pilot studies on data security, enhanced representations of rapidly generated terrain databases, tools and techniques for acquiring knowledge of individual performance, modular reconfigurable C4I interface (MRCI) will be demonstrated, and system representations will be developed by the Services. By FY98, demonstrate advanced versions of HLA, RTI, MRCI, environment/system representations. From FY97 to FY01, development new application support services, protocols and standards, network communications services, and the application of dynamic multicast grouping technologies will be required.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0603832D/ADS	73.2	57.7	67.3	70.5	72.3	74.0
0602308A/ADS	8.0	9.8	10.4	10.8	10.8	11.1
0603313A/ADS	6.0	8.1	8.7	5.7	0	0
0602618A/ADS	0.3	0.4	2.4	0	0	0
0602308C/ADS	TBD	TBD	TBD	TBD	TBD	TBD
062702E/ADS	2.2	2.2	0	1.1	2.1	3.0
063744E/ADS	5.2	0	0	0	0	0
Total	**94.9**	**78.2**	**88.8**	**88.1**	**85.2**	**88.1**

F.04. Joint Training Readiness. By FY01, develop advanced Joint-force performance assessment and feedback tools for estimating training proficiency and training readiness. Tools include metrics and methods for assessing how well Joint forces communicate, coordinate, and synchronize resources and firepower to achieve JMET in a modeling and simulation environment. Existing tools used by individual Services are subjective and difficult to aggregate for Joint use. New tools will be tested in operational training exercises that leverage large investments in distributed synthetic environments, modeling, and simulation. These tests use the Fire Support mission (air, ground, sea, and C4I). DTO success will be shown by 30 percent less time to achieve training readiness, increased precision in measuring it, and a 50 percent increase in the number of warfighting tasks demonstrated effectively during exercises.

By FY98, develop and test procedures for conducting and evaluating Fire Support training.

By FY99, develop and test guidelines for planning and conducting systematic, vertical (multi-site, multi-Service, multi-echelon) after-action reviews and in-process training reviews. By FY00, provide methods (a) for linking performance in Joint training exercises to estimates of readiness, and (b) for using performance and assessment data in cost-effectiveness evaluations to guide joint training policy and resources.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
063007A	0	0.6	0.6	0.6	0.6	0.6
062205F	0	0.5	0.5	0.6	0.5	0
063227F	0	0.4	0.4	0.6	0.5	0
060233N	0	1.3	1.3	1.0	0.5	0
300900D	0	1.0	1.5	1.5	0.5	0
Total	**0**	**3.8**	**4.3**	**4.3**	**2.6**	**0.6**

F.05. Joint Readiness, Planning, and Assessment (JRPA) JWE.

GOAL: Scheduled in conjunction with a currently projected joint exercise, this JRPA JWE will demonstrate the integration of the multiple technologies developed by the proposed DTOs in the Joint Readiness JWCO. The JRPA JWE, while conducted at the joint and component staff level, will allow selected missions to be executed at the individual combatant or platform level with humans in the loop being immersed in an accredited synthetic environment (STOW and ADS DTOs). Special Operations or critical strike missions can be examined in minute detail during rehearsals to reduce risk and examine alternative COAs. Staff training will include distributed collaborative planning using real-world C4I systems with an M&S capability for mission rehearsal, dynamic re-tasking, and advanced decision aids for both commander and subordinate staffs (AJP and ADS DTOs). Assessment of joint training readiness will be validated by M&S tools and will use accredited algorithms to predict the impacts of current operations and resourcing decisions on future readiness (JTR and ADS DTOs). This JWE will also incorporate advancements yielded by DTO's from other sections, specifically: Rapid Battlefield Visualization ACTD (A13), Battlefield Awareness and Data Distribution (BADD) ACTD (A14), Information Security ACTD (A29), Assurance of Services (A31), MOUT ATCD (Proposed) (E05), DARPA Advanced Logistics Program (K03).

Service/Agency POC:	**Customer POC:**	**USD (A&T) POC:**
TBD	TBD	TBD

Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
JWE funding TBD	TBD	TBD	TBD	TBD	TBD	TBD
Total						

G. JOINT COUNTERMINE

G.01 Land Mine Neutralization

G.02 Land Mine Detection

G.03 Land Countermine

G.04 Littoral Mine Obstacle Detection

G.05 Littoral Mine Obstacle Clearance

G.06 Littoral Countermine

G.07 Sea Mine Detection

G.08 Sea Mine Clearance

G.09 Sea Countermine

G.10 Joint CM ACTD (was CM ACTD)

G.01. Land Mine Neutralization. To provide the maneuver commander the mounted and dismounted capability to rapidly neutralize land mines in support of the maintenance of operational temp. The Off-Route Smart Mine Clearance (ORSMC) will demonstrate the capability to neutralize off-route smart mines in FY96. This system uses a remote controlled vehicle with survivability enhancements to emulate vehicle signatures to decoy mines into activation and then survive the munition sublet. To meet the close-in mounted objective an explosive/kinetic neutralization capability will be demonstrated on a ground vehicle platform in FY98. This technology will be integrated into the Mine Hunter/Killer System to be demonstrated as an integrated system in the FY00 time frame. A concurrent FY00 demonstration will explore the use of RF technology to defeat electronically fused mines from standoff distances. This effort will be evaluated for incorporation into the ground-based Mine Hunter/Killer program as well as it's possible application for integration in an airborne platform to provide an aerial Hunter/Killer capability to neutralize electronically fused, conventional, and smart munitions. During FY01, a demonstration of chemical neutralization of landmines will provide for the nonexplosive neutralization mines for use in these situations where a possible high order detonation would pose a danger to facilities or troops. Seizing on the advancements in mobile power sources, the application laser-directed energy for mine neutralization will be demonstrated in the FY05 time frame. This effort is keyed to reduced logistics, greater standoff, and enhanced safety in the neutralization landmines.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0603606A/D608	1.0	2.1				
0603640M/C2078	1.6	2.4				
0602786A/AH20	1.9	2.2				
0602712A/AH94			2.2	2.5	3.1	
Total	**4.5**	**6.7**	**2.2**	**2.5**	**3.1**	**0.0**

G.02 Land Mine Detection. To provide the maneuver commander an all weather day/night standoff air and ground capability to detect all landmines in support of both mounted and dismounted operations. Landmine detection forms the core requirement for countermine operations. Detection requirements for all capabilities will be met through the application of multiple technologies and data fusion combined with Automatic Target Recognition (ATR). A ground-based detection system Vehicle Mounted Mine Detection System (VMMD) ATD is scheduled for completion in FY98. Technologies being explored include passive IR and Ground Penetrating Radar. Furthering the VMMD effort will be the combining of ground-based detection effort with standoff neutralization into a capability designated Mine Hunter/Killer. This will provide a capability to detect and destroy mines from a single platform in supporting the maintaining of operational tempo. A demonstration of the capability is planned for FY00. To meet the dismounted requirement, the Close-in Man Portable Mine Detector is combining passive IR and Ground Penetrating Radar. Forward Looking Radar will be demonstrated in FY98 to evaluate potential enhancements to the VMMD and Hunter/Killer capability by providing for greater standoff and enhanced all weather capability. Hyperspectral/Multispectral technologies will be evaluated in order to provide performance enhancements to both airborne and vehicle mounted systems. These technologies are planned for demonstration in the FY03 time frame. The application of biosensor technology provide for another possible technological enhancement for ground-based detection systems' clutter reduction in the identification/configuration of explosive compounds. Continuing work will be undertaken throughout this entire time frame to expand the current effort in ATR which will serve to enhance the target discrimination performance of the multiple sensors being employed on the various platforms. Neural Net research forms the core of this effort.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0603606A/D608	7.8	4.5	6.2			
0602786A/AH20	1.0	1.7				
0602712A			1.8	1.9	2.4	
0602702/E(MTES)		3.0				
0603226E/EE30			2.5	1.5		
Total	**8.8**	**9.2**	**10.5**	**3.4**	**2.4**	**0.0**

G.03. Land Countermine. Land Countermine provides the maneuver commander an in-stride, robust, and mission tailorable capability to detect mines and minefields, to neutralize off-route mines, and to breach minefields in support of both mounted and dismounted operations. To achieve this objective, a system will be developed which combines ground based detection with stand-off neutralization techniques into a Mine Hunter Killer system, beginning in FY98. This system will provide the capability to detect and destroy mines from a single platform during in-stride, operational tempo maneuvers. To support this close-in mounted objective an explosive/kinetic neutralization capability will be demonstrated on a ground vehicle platform in FY98. This technology will be integrated into the Mine Hunter Killer system to be demonstrated as an integrated system in FY00. In addition to neutralization techniques, detection technologies such as Forward Looking Radar will be demonstrated in FY98 to evaluate potential enhancements for the Hunter Killer capability by providing for greater standoff and enhanced weather capability. Key to the demonstrations in 1999 and 2002 is development of realistic models and simulations. Models and simulations are critical in the system of systems solution for determination of operational usage and integration into current force structures prior to deployment of the field exercises.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0603606A/0608	0	0	0	7.6	9.1	0
0603226E/EE39	9.0	0	0	0	0	0
Total	**9.0**	**0**	**0**	**7.6**	**9.1**	**0**

G.04. Littoral Mine Obstacle Detection. To provide the capability to collect, correlate, and report pre-hostility MIW operations from production to minelaying, and to determine the extent of minefields and mines in the amphibious operations area, the precise location of mines, and the environmental factors affecting MCM operations. To accomplish this goal, naval forces must have the capability to monitor an operational area continuously in all weather. When mining activities are detected, before mines are laid, precise targeting for interdiction needs to be provided to the commander. Finally, based upon the observation of minelaying activities, should factors such as ROE prevent the interdiction before mines are placed, localization and identification of mine must be made. Current practice is limited by inefficient use of dedicated platforms in theater including National Technical Means, difficulties in fusing data from many sources for a common tactical picture, low search rates caused by large false alarm rates and high clutter for sensors, and difficulties characterizing battlespace environment for the proper use of sensors. Continuous surveillance of the amphibious region cannot be performed today, and our ability to provide clandestine reconnaissance is severely limited. Littoral remote sensing (LRS) will provide automated exploitation for NTM sensors. Demonstration of new products from LRS will occur during the JCM ACTD exercises in FY97 & 98.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0603782N/R2226	7.1	2.5	3.5	3.5	3.5	
0602315N	2.8	2.0	2.0	2.0	2.0	
0603640M/C2078	2.1	2.9	0.0	0.0	0.0	
0602131M/C3170	2.6	2.0	1.5	1.4	1.0	
Total	**14.6**	**9.4**	**7.0**	**6.9**	**6.5**	

G.05. Littoral Mine Obstacle Clearance. The goal of this defense technology objective is to identify and dispose of mines in very shallow water (less than 40 ft) through the surf zone to the craft landing zone with minimal casualties to men and equipment. Accomplishing this goal requires localization and identification of individual mines and rapid disposal by explosive neutralization or sweeping. Currently, the Navy is limited by the difficulty of rapidly determining the precise location of bottom mines and mines, especially antipersonnel mines in the surf zone and beach. There is no current capability to clear mines from the surf zone. A major objective is to remove men from the task of attaching explosives to mines for neutralization. Explosive Neutralization ATD will demonstrate in FY98, as part of the JCM ACTD, a scaled bead zone array deployed from an unpowered glider. ALISS ATD will also demonstrate in the FY98 JCM ACTD an advanced lightweight influence sweep system using signature emulation technologies. JAMC's teleoperated bulldozer will demonstrate clearance of beach mines in the JCM ACTD FY97 exercise.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0603782N/R2226	16.6	13.1	12.4	5.0		
0602315N	5.2	5.3	5.4	5.3	5.3	
0603640M/C2078	2.7	3.5	1.0			
0602131M/C3170	2.3	1.5	1.7	1.9	1.9	
Total	**26.8**	**23.4**	**20.5**	**12.2**	**7.2**	

G.06 Littoral Countermine. To provide the task force commander the confidence that he can place his sea-going assets to exercise this maximum capabilities without regard to mine or obstacle hazards in the amphibious operations area. Amphibious mine countermeasures is a core element of battlespace dominance in preparation for an in-stride, high speed minefield breaching from the sea. The elements of this objective are minefield surveillance and reconnaissance, mine detection and avoidance, mine classification, identification, clearance (neutralization or removal), and C4I. Modeling and simulation efforts complement JCOS development and will provide JMCIS compatible MCM warfighting evaluation tools by FY98-99. ORSMC will provide an off-road capability to neutralize smart mines through signature emulation of combat vehicles. By FY99, demonstrate Mine Countermeasures Integration and Automation (MCMIA) which integrates and assesses existing MCM technologies on multiple robotic platforms for MCM operations.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0602315N	1.8	2.6	2.1	2.6	2.6	3.6
0603640M/C2078	1.1	2.3	0.0	0.0	0.0	0.0
0602131M	0.2	0.7	1.1	1.4	1.1	0.0
Total	**3.1**	**5.6**	**3.2**	**4.0**	**3.7**	**3.6**

G.07. Sea Mine Detection. To provide the capability to collect, correlate, and report pre-hostility MIW operations from production to minelaying, and to determine the extent of minefields and mines in the theater of operations, the precise location of mines, and the environmental factors affecting MCM operations. To accomplish this goal, naval forces must have the capability to monitor an operational area continuously in all weather. When mining activities are detected, before mines are laid, precise targeting for interdiction needs to be provided to the commander. Finally, based upon the observation of minelaying activities should factors such as ROE prevent the interdiction before mines are placed, localization and identification of mines must be made. Current practice is limited by inefficient use of dedicated platforms in theater including National Technical Means, difficulties in fusing data from many sources for a common tactical picture, and difficulties characterizing battlespace environment for the proper use of sensors. Continuous surveillance of sea lanes of communications and ocean operating areas cannot be performed today, and our ability to provide clandestine reconnaissance is severely limited. The Advanced Sensors technology demonstration is developing a group of acoustic sensors featuring computer aided detection/classification for mines in the water volume and proud bottom mines. These sensors will be demonstrated in the FY98 JCM ACTD.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0602315N	8.0	12.0	11.0	10.5	7.0	
Total	**8.0**	**12.0**	**11.0**	**10.5**	**7.0**	

G.08. Sea Mine Clearance. The goal of this defense technology objective is to identify and dispose of mines in deep to shallow water with minimal casualties to men and equipment. Accomplishing this goal requires localization and identification of individual mines and rapid disposal by explosive neutralization or sweeping. Currently, the Navy is limited by the difficulty of rapidly determining the precise location of bottom mines. Mines within the volume are amenable to current technology if properly fielded. Sweeping of acoustic and magnetic influence mines is a limiting factor especially with the advancing technology of threat mines. Finally, to provide explosive neutralization, there is a lack of a standoff weapon that can positively destroy mines avoiding the use of EOD personnel. To alleviate this problem, RAMICS is developing a hypervelocity, supercavitating projectile to be fired from a helicopter.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0603782N	11.7	6.6	7.9	0.0	0.0	0.0
0602315N	3.0	5.3	5.0	5.0	6.0	13.0
Total	**14.7**	**11.9**	**12.9**	**5.0**	**6.0**	**13.0**

G.09. Sea Countermine. To provide the task force commander the confidence that he can place his sea-going assets to exercise their maximum capabilities without regard to mine or obstacle hazards in the operations area. Advanced ship degaussing methods being developed as part of this DTO will reduce the range of vulnerability of steel hull and MCM ships by 75%. Sea mine countermeasures is a core element of sea control and battlespace dominance. The elements of this objective are minefield surveillance and reconnaissance, organic mine detection and avoidance, mine classification, identification, clearance (neutralization or removal) and C4I.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0603782N/R2226	7.0	4.1	6.0	5.4	0.0	0.0
Total	**7.0**	**4.1**	**6.0**	**5.4**	**0.0**	**0.0**

G.10 Joint Countermine Advanced Concept Technology Demonstration. By FY97, demonstrate (Demo I) ability to conduct joint U.S. Army/U.S. Marine Corps/U.S. Navy land countermine operations using CIMMD, ORSMC, JAMC, COBRA, and other advanced development and fielded countermine systems. By FY98, demonstrate (Demo II) ability to conduct seamless operations from deep water, through the beach to land objectives using ALISS, ENATD, Advanced Sensors, and Littoral Remote Sensing Mine Countermeasure capability. By FY00, demonstrate (Demo III, proposed) capability to conduct seamless joint sea/land countermine operations integrated with potential coalition force partners and the emerging science and technology products in research today. By FY03, demonstrate (Demo IV, proposed) advanced technology concepts integrated with previous Demo residuals.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00
0603606A/D608	7.5	7.4	7.6	5.7	2.2	1.4
0603782N/R2226	5.6	6.8	8.1	10.1	3.9	1.5
Total	**13.1**	**14.2**	**15.7**	**15.8**	**6.1**	**2.9**

H. ELECTRONIC WARFARE

H.01. Ship Defense Against IR Missiles / "MATES" ACTD (Deferred FY96). Accelerate the development and deployment of advanced electro-optic countermeasures (EOCM) systems to defeat modern anti-ship missiles (ASCMs) equipped with infrared (IR) seeker, both imaging and non-imaging. Existing capabilities for defeating this threat are inadequate to assure a high level of survivability. The technology required to provide this capability has been developed and demonstrated in the MATES ATD and is ready for operational evaluation. An EOCM fieldable prototype system based upon the successful MATES ATD program will be designed, built, and integrated into a ship-compatible configuration, and installed and integrated into the ship Self Defense Test Ship (SDTS) for at-sea tests against captive-carry and free-flight ASCM threats at significant military ranges. The integrated system will be tested and evaluated by operational forces against a variety of representative ASCM threats, under a range of operational scenarios in fully integrated sense (i.e., utilizing all available ship defense assets). A foreign seeker and a domestic seeker are two of the ASCMs to be used in the test. The foreign missile represents older technology in the 3-4 micron band and the domestic missile is an advanced imaging seeker in the 8-12 micron band. This ACTD will be initiated as an FY97 start within the OSD ACTD Program and end in early FY01 with the at-sea trials. In FY97, a solicitation will be made, an integration contractor selected, and a preliminary system design completed. During FY98, the final system design will be completed and fabrication begun; as well, a comprehensive system model and operational simulation capability will be developed. In early FY00, the system will be completed and delivered. At-sea testing will commence in early FY01.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
MATES ACTD (P.E. TBD)		1.0	2.0	5.8	5.7	4.3
0602702E/	3.5	3.5				
0603270F/691X	1.9	4.9	5.4	1.1		
0602270N	0.4					
Total	**5.8**	**9.4**	**7.4**	**6.9**	**5.7**	**4.3**

H.02. Multi-Spectral Countermeasures ATD. This program will develop and test advancements in laser technology, energy transmission and jamming techniques for an all laser solution to infrared countermeasures (IRCM), as P3I to the Advanced Threat IRCM/Common Missile Warning System (ATIRCM/CMWS) program. These improvements will provide the capability of countering both present and future multi-color imaging focal plane array and non-imaging missile seekers. These improvements will demonstrate a 4X increase in jam to signal(J/S) ratio, a 2 to 3X reduction in laser jam head volume, a 1.2 kilowatt (50%) decrease in ATIRCM/CMWS prime power consumption, and an overall reduction in system weight of 35 pounds. By FY97, evaluate IRCM techniques with laser and evaluate fiber optic cable options. By FY98, integrate laser, fiber optic coupler, and advanced tracker/jammer algorithms and begin lab testing. By FY99, conduct live fire cable car test to demonstrate countermeasure capability against advanced imaging IR missiles and other secondary threats such as anti-tank guided missiles (ATGM) to rotary-wing aircraft.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0603270A/DK16		3.0	4.0	6.0		
0603792N	5.3	5.4				
Total	**5.3**	**8.4**	**4.0**	**6.0**		

H.03. Hit Avoidance ATD. Demonstrate advanced “hit avoidance” technology for hemispherical, ground combat vehicle protection against smart threats. The primary task is to demonstrate a near term active protection concept to defeat hit-to-kill smart threats. The secondary tasks include development of both integrated hit avoidance engineering performance models and a universal threat resolution module. Active protection components are scheduled for test in FY96, with system demonstration in FY97. A system engineering simulation will be developed through integration of threat, sensor, countermeasure, and ancillary support models in FY96 and evaluated in FY97. The universal threat resolution module, which identifies the threat and provides appropriated countermeasure response options, will be developed in FY95/FY96 and evaluated in FY97. The goal is to reduce hit probability from the current figure of 0.8-0.9 down to 0.2, improving survivability by a factor of about four.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
63005/D221	8.3	4.3				
63270A/ DK16	1.1	0.0				
Total	**9.4**	**4.3**				

H.04. Miniature Air Launched Decoy (MALD) ACTD. Develop and demonstrate an affordable decoy system for tactical fighter applications in the non-lethal SEAD mission. MALD is planned to be an expendable decoy and will demonstrate its military utility in offensive operations against enemy air defense systems by diluting and confusing such surface-based and airborne defenses with realistic tactical target characteristics. By FY98-99, MALD flight testing will demonstrate operational effectiveness in a Green Flag environment (or equivalent) and not exceed a 100 pound, $50K fly-away package. A secondary capability for demonstration will be a simultaneous self-protection capability for the launching fighter/group of fighters. At the end of the ACTD, 32 MALD systems will remain with the operational user for contingency operations or follow-on demonstrations.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
MALD ACTD 602702 E/TT06	4.4	19.1	14.0	5.5	0	0
Air Force (TBD)						
Total	**4.4**	**19.1**	**14.0**	**5.5**	**0**	**0**

I. INFORMATION WARFARE

I.01. Digital Communications Electronic Attack. Provide the capability to intercept and bring under electronic attack advanced digital telecommunication systems and to apply this capability to the disruption, denial, and deception of modern information systems. By FY97, demonstrate electronic attack against selected modern digital telecommunication capabilities. By FY99, demonstrate the ability to disrupt, deny use of, and deceive selected modern digital telecommunication systems. When complete, this will provide an electronic attack capability against advanced communications in use today, and those that are being further technologically developed, and which are recognized as threat capabilities which will have to be faced in future conflicts.

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Programmed DTO Funding ($M):

Program Element/Project	FY95	FY96	FY97	FY98	FY99	FY00	FY01
62270A/A906	0	2.9	3.5	3.5	3.7	0	0
63270A/DK15	0	0	1.2	1.2	1.3	0	0
Total	**0**	**2.9**	**4.7**	**4.7**	**5.0**	**0**	**0**

I.02. Information Warfare Planning Tool ACTD (Proposed). Provide in-theater offensive IW planning aids that help the warfighter quickly choose IW options via modeling and simulation tools. The tools will allow CINCs to choose the best IW tools and targets and will integrate lethal and nonlethal options to support objectives. By FY99, demonstrate semi-automated tools that will bring IW-related components into the planning process to meet CINC stated objectives. Initially, the tool will be centered on Integrated Air Defense Systems. By FY01, incorporate other target systems as they become available.

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Programmed DTO Funding ($M):

Program Element	FY97	FY98	FY99	FY00	FY01
0208021F	0.5	1.0	0.5	0.0	0.0
OSD/AT (TBD)					
Total	**0.5**	**1.0**	**0.5**		

*Residual Support.

I.03. Navigation Warfare ACTD. This ACTD has three goals: (1) develop techniques and equipment to protect the use of the Global Positioning System (GPS) in the face of hostile countermeasures; (2) limit the ability of hostile forces to obtain military benefit from GPS; and (3) provide an environment to develop and refine concepts of operation (CONOPs) for the use of GPS in the face of electronic countermeasures (ECM). A fourth objective is to accomplish the first three goals without impacting the civilian use of GPS outside of the theater of military operation. No changes to the GPS satellites or to the GPS navigation signal structure are planned as part of the ACTD. The ACTD will leave behind GPS receivers that can directly access the encrypted military navigation code P(Y), CONOPS for the use of GPS in a stressed environment, and other equipment.

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Programmed ACTD Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0305154D	6.7	9.3	3.7	6.8	3.9	4.1
Air Force - Other	1.6	0.2	0	0	0	0
0603750D/P523	6.7	4.5	3.9	0.3	0	0
Total	**15.0**	**14.0**	**7.6**	**7.1**	**3.9**	**4.1**

J. CHEMICAL/BIOLOGICAL AGENT DETECTION

J.01. C/B Modeling. By FY96, develop, verify, validate, and document a hazard model for operational use. This same model will also be the basis for systems which support TBMD COEAs, BW detector studies, training, etc. By FY97, demonstrate the ability to evaluate the operational performance of representative Stand-Off C/B detector systems using the Distributed Interactive Simulation (DIS). By FY FY99 standardize a joint suite of models. This will include a high resolution, computational fluid dynamics (CFD) model for detailed analysis of ships, combat vehicles, shelters, *etc*. By FY02 complete algorithms for inclusion in the JCS JWARS model for joint tactical and strategic campaign analyses. These accomplishments will result in a standardized and documented DIS compliant joint capability for the full range of CBW hazard analyses for materiel development, combat development, training, test and evaluation, COEAs, and operational requirements.

Supports: Laser Stand-Off C/B detectors, lightweight stand-off chemical detector, NBC Reconnaissance Vehicle, Shipboard Advanced Liquid Agent Detector (SALAD), JSLIST, Armored Systems Modernization, LAM Exercises, Battlefield Distributed Simulation–Development (BDS-D) ATD, Combined Arms Tactical Trainer ATD, Integrated Bio ATD, JWARN, JWARS, JPO-BD Air Base/Port Bio Detection Network ACTD, Maneuver Control System (MCS), and the Tactical Environmental Support System (TESS).

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0602384BP/CB2	12.9	9.6	TBD			
Total	**12.9**	**9.6**				

J.02. Biological Early Warning ACTD (proposed). Maneuver forces and troops are particularly vulnerable to upwind releases of a biological warfare (BW) agent. Such a release can produce a widely-dispersed cloud with difficult-to-measure agent concentrations which can be lethal to humans. Early warning (stand-off and remote detection) of BW agents is thus essential to providing downwind personnel with as much warning time as possible to allow them to assume the appropriate protective posture or to avoid contamination completely. The objective of this proposed ACTD is to develop, demonstrate and field stand-off and remotely-employable point detection capabilities which can detect, identify, and characterize BW agents. These detection capabilities will include alarms which will be integrated into appropriate warning and reporting networks to promptly alert all personnel who may be exposed to BW contamination. This ACTD would develop and demonstrate the use of a helicopter-mounted eye-safe LIDAR which can detect particulate clouds (with respirable particles in the 1-10 micron range) at distances of 20 to 50 kilometers, depending on particle density. This LIDAR will not identify or characterize the particulate matter. To identify and characterize suspected BW agents, miniaturized and sensitive detectors (able to detect 1 to 10 agent containing particles per liter of air) are to be developed that can be remotely employed through air-drop, artillery, SOF emplacement, or mounted on unmanned aerial vehicles (UAVs). These miniaturized detectors may be selected from systems demonstrated under the Integrated Biodetection ATD or at Joint Biological Field Trials. Small, low-power air samplers must also be developed for remote deployments and may be integrated with biodetection systems. Present plans inlude (1) an FY96 demonstration of a miniaturized detector for SOF utilization, and (2) an ACTD that will demonstrate end-to-end stand-off and remote BW agent detection capabilities during FY98-99.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0604384D/CA5 & CP5	22.1	21.1	32.9	48.2	0.0	0.0
0603750D	0	0	0	0	4.0	4.0
Total	**22.1**	**21.1**	**32.9**	**48.2**	**4.0**	**4.0**

J.03. Airbase/Port Biological Detection ACTD. By FY98, develop and demonstrate a biological early warning capability and operational procedures to detect, alarm, warn, dewarn, identify, protect, and decontaminate large areas against a biological warfare (BW) attack on an air base or port facility. By FY96, initiate aerosol sampling in Korea and Saudi Arabia, model air base/port scenario excursions, and demonstrate in CONUS a small networked biological detection array with a generic detection (bio/not bio) capability. By FY97, demonstrate in CONUS a total system, to provide rapid detection (5 minutes versus 15 minutes), semi-automated versus manual warning and reporting of a BW attack using RF links, protection (collective protection and commercial oronasal masks), identification (20 versus 30 minutes) and sample handling of 8 high threat agents versus 4, and large area decontamination. This ACTD will demonstrate for the first time the capability to detect and protect high value fixed site assets against point and long line source BW attacks.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0603002D/CB3	2.0	3.0	18.0	2.0	1.0	0.0
0603750D	1.8	3.0	1.0	2.0	1.0	
Total	**3.8**	**6.0**	**19.0**	**4.0**	**2.0**	**0.0**

K. REAL TIME LOGISTICS CONTROL

K.01 Total Distribution ATD

K.02 Joint Logistics ACTD

K.03 DARPA Advanced Logistics Program

K.01. Total Distribution ATD. The success of the Log Anchor Desk (LAD) in satisfying the logistics user's needs for decision support software coupled with the advances made in the Common Operating Environment (COE) and in the architecture of the Command and Control (C2) system has resulted in a merger of the LAD efforts with the Total Distribution Advanced Technology Demonstration (TD ATD). The goal of the merger is to continue the development of the functionality of the LAD while integrating it with data sources as they are developed and integrating it into the C2 system's architecture. This approach provides two products for the logistics community: (1) Technology transfers into the logistics command and control systems such as the Combat Service Support Control System (CSSCS) and the logistics component of the Army Global Command and Control System (AGCCS) as they are developing their capability packages. (2) An interim leave-behind workstation for the user that will enhance his "go-to-war" capability while it evolves from a stand alone system to a fully integrated capability in the C2 systems. The ATD will utilize the Prairie Warrior Exercises in FY95, FY96, and FY97 building up to Task Force XXI in FY97 to allow the operational user to further define requirements in order to increase the functional capabilities of the LAD. These will be integrated with the Capability Packages of the logistics portion of AGCCS and the software development of CSSCS. The logistics workstation will progress from a stand alone workstation (FY95) into a client-server based architecture of the C2 system (FY96) with a final goal of a complete integration into the legacy systems (AGCCS, CSSCS) (FY97). The Battle Lab at CASCOM has defined the Measures of Effectiveness in the areas of improving response time for planning and execution of logistics tasks, improving the synchronization of the closure of the warfighting force with the sustainment force to support the operational plan.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
63734A/T10	9.6	10.1	0.0	0.0	0.0	
Total	**9.6**	**10.1**	**0.0**	**0.0**	**0.0**	

K.02. Joint Logistics ACTD. Develop and demonstrate an automated Joint logistics awareness and analysis capability to view the logistics battlespace, collaborate in shared information, and integrate existing strategic and operational logistics data and tools. This goal will be achieved by a network of workstations connecting operational planners and logisticians across Services and echelons. Advanced data distribution and visualization techniques are utilized to provide a common, relevant picture. The Joint Logistics ACTD integrates existing logistics models with knowledge based tools to provide decision support to the Commanders, and is Global Command and Control System (GCCS) compliant. The approach is to apply mature DoD and commercial sector technologies to a significant subset of critical logistics problems identified by the Operational Users. The network will provide the platform for the rapid integration of logistics data and tools adaptable to meet joint mission requirements in CINC exercises and operational contingencies. Shared data and tools will be used to demonstrate distributed, collaborative planning to solve logistics problems.

By FY96, demonstrate at USEUCOM, USACOM, and USCENTCOM and their service components a course of action planning, visualization, and replanning capability. During FY97/98, provide at each of those commands as well as USPACOM a network of workstations connecting operational planners and logisticians across services and echelons, and leave behind a residual capability for advanced logistics information visualization, distribution planning, and decision support. On-site support and software maintenance will continue through FY99.

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Programmed DTO Funding ($M):

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
Total	21.6	22.1	6.0	6.0		

K.03. DARPA Advanced Logistics Program. Develop and demonstrate software tools and protocols needed to gain control of the logistics pipeline and enable the warfighter to project and sustain overwhelming combat power sooner. Specifically, the Advanced Logistics program will produce advanced information technology to put the right materiel in the right place, at the right time, while supporting the need to do so with reduced reliance on large DoD inventories. The program will develop a shared technology base of information manipulation and planning tools to support planning, execution, monitoring, and focused replanning throughout the logistics pipeline. This will be demonstrated through a system that tightly couples continuous planning and execution monitoring in an interoperable course of action (COA) and logistics support environment linking CINC Operations (J3) and Logistics (J4) Staff, DLA, and TRANSCOM. The program will focus on four main areas:

- Transportation tools to track assets and make smarter use of lift.
- Rapid supply services for faster and more flexible acquisition of supplies.
- Force sustainment planning and sourcing.
- Logistics COA feasibility planning that is linked to the war plan.

During FY96-FY97 (Phase I), the Advanced Logistics program will develop and demonstrate data gathering tools to include semi-autonomous capture, search, and retrieval of data in disparate defense and commercial logistics sources. Servers for transportation, sustainment, and rapid supply services will be developed, upon which integrated applications that support the planning, direct scheduling, and execution of the movement will be run. This architecture will provide for collaborative visualization and a decision support environment for force deployment from a fort to a port. Also the program will develop automated supply and sustainment source locating and purchasing tools and demonstrate coarse-grained course of action evaluation.

During FY98-FY99 (Phase II), the Advanced Logistics program will demonstrate an integrated environment to support the planning, execution, and monitoring of a major force deployment from fort to port to ship load, including optimized scheduling and routing with zero staging throughout the move. Collaborative decision environment will be expanded for in-theater units, DLA, and service logistics commands. An automated Dynamic Critical Items List will be developed as an integral part of sustainment planning and execution. The Advanced Logistics program will develop and demonstrate the ability to rapidly negotiate between suppliers and buyers, through information exchange, including rapid, flexible item and item relationship catalogs. Significant research will be done to develop deviation detection sentinels and predictive analysis tools and demonstrate a medium grained course of action evaluation.

During FY00 (Phase III), the Advanced Logistics program will develop and demonstrate a complete end-to-end Advanced Logistics System for the planning, execution, monitoring, and rapid replanning of a major force deployment from CONUS to in-theater final destination. Included will be dependency-driven notification for reactive replanning, a logistics annex for the OPLAN, and a fine grained course of action evaluation.

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Programmed DTO Funding ($M):

Program Element	FY96	FY97	FY98	FY99	FY00	FY01
0602301E	4.3					
0602702E	6.3	17.2	28.7	16.7	7.6	
Total	**10.6**	**17.2**	**28.7**	**16.7**	**7.6**	

L. COUNTERPROLIFERATION, COUNTERFORCE

1. Passive Defense DTOs

L.01 Medical Biological Defense

L.02 Medical Chemical Defense

2. Counterforce DTOs

L.03 Counterproliferation I ACTD (Technologies to Defeat Shallow-Buried Biological and Chemical Weapon Storage and Production Facilities)

L.04 Counterproliferation II ACTD (Technologies to Defeat an Expanded WMD Target Set Including Surface, Mobile, and Deeply Buried Targets)

L.01. Medical Biological Defense. Develop, demonstrate, and field new vaccines, drugs, and diagnostic kits for prevention, treatment, and diagnosis of biological warfare agents. This DTO will protect forces from the consequences of exposure to biological agents and force survivability and mission accomplishment. Fulfilling this DTO will be achieved by accomplishing several objectives. By FY00, conduct a Milestone 0 transition of an improved SEB toxin vaccine. By FY97, conduct a Milestone 0 transition of candidate ricin toxin vaccines and a Milestone 1 transition by FY00. By FY98, transition an improved *Yersinia pestis* (Plague) to Advanced Development. By FY98 transition a forward deployable diagnostic kit to Advanced Development. By FY99, transition a botulinum toxin vaccine to Advanced Development. By FY00, transition to Advanced Development a multi-component VEE/EEE/WEE vaccine. By FY04, transition to Advanced Development a bivalent Ebola virus/Marburg virus vaccine.

Supports: Responds to JCS/JROC Counterproliferation Priority #6 and #8.

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Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0602787A/TB2	11.2	11.6	12.0	13.1	13.0	13.4
0603002A/TB3	9.9	10.6	14.5	15.2	15.4	15.7
Total	**21.1**	**22.2**	**26.5**	**28.2**	**28.4**	**29.1**

L.02. Medical Chemical Defense. Develop, demonstrate, and field new prophylactic measures, drugs, and diagnostic kits for prevention, treatment, and diagnosis of chemical warfare agents. This DTO will protect forces from the consequences of exposure to chemical agents and force survivability and mission accomplishment. Fulfilling this DTO will be achieved by accomplishing several objectives. By FY00, conduct a Milestone 0 transition of an vesicant agent countermeasures. By FY99, conduct a Milestone 0 transition of a reactive topical skin protectant against nerve and vesicant agents. By FY99, conduct a Milestone 0 transition of a reactive/catalytic nerve agent prophylaxes.

Supports: Responds to CINC/JROC Counterproliferation Priority #6.

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Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0602787A/TC2	12.9	13.4	14.0	15.3	15.2	15.6
0603002A/TC3	9.4	8.9	10.1	10.6	10.6	11.0
Total	**22.3**	**22.3**	**24.1**	**25.8**	**25.9**	**26.6**

L.03. Counterproliferation I ACTD (Technologies to Defeat Shallow-Buried Biological and Chemical Weapon Storage and Production Facilities). Develop and demonstrate technologies to effectively target and defeat chemical and biological production facilities that are shallow-buried or bermed, above-ground targets while minimizing collateral damage. This technology development is for demonstration in Phases I and II of the Counterproliferation/ Counterforce ACTD. Technologies being developed fall into three categories: weapons, sensors, and planning/targeting tools. In Phase I of the ACTD, to be completed in FY96, the application of current warhead technology augmented with a programmable, void-sensing/DOB-sensing Hard-Target Smart Fuse (HTSF), being developed by Wright Lab, will be demonstrated. Planning tools for targeting (MEA) and collateral effects prediction (HPAC), being developed by DNA, will also be demonstrated. In Phase II, to be completed in FY98, these Phase I technologies will be supplemented by the following technologies. The Advanced Unitary Penetrator (AUP), being developed by Wright Lab, will provide the penetration capability of the BLU-113 in a BLU-109-class bomb. The Inertial, Terrain-Aided Guidance (ITAG) system, being developed by Sandia Lab, will provide reduced CEP over current systems employing the BLU-109 while providing adverse-weather capability. The Weapon-Borne Sensor (WBS), being developed by Wright Lab, will provide the acceleration history of the penetrator to provide target characterization and BDA. Unattended Ground Sensors (UGS), being developed by Sandia Labs and LLNL, will provide characterization and location of critical equipment for targeting and BDA. And a modified FLIR, being developed by DNA, will measure plume signatures for BDA. The planning tools MEA and HPAC will be integrated to provide increased utility for targeting and collateral-effects prediction in Phase II. They will also be upgraded to provide more accurate predictions for hardened, buried structures.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0603160D/P6539	38.2	53.8	7.4	2.2	1.5	0.0
0602160D/P6533	9.2	0.0	0.0	0.0	0.0	0.0
0605160D/P6542	3.6	2.8	0.0	0.0	0.0	0.0
0603750D/P6523	0.5	0.0	0.0	0.0	0.0	0.0
PE62715H/AB	2.8	0.4	0.0	0.0	0.0	0.0
DUSD (A&T)	0.5	1.6	1.0	4.4	5.1	0.0
Total	**54.8**	**58.6**	**8.4**	**6.6**	**6.6**	**0.0**

L.04. Counterproliferation II ACTD (Technologies to Defeat an Expanded WMD Target Set including Surface, Mobile, and Deeply Buried Targets). Develop and demonstrate technologies to defeat a broad range of WMD targets while minimizing collateral damage. The targets are divided into three categories corresponding to Phases III through V of the Counterproliferation/ Counterforce ACTD. The first set includes mobile BW/CW missiles in the open (stationary) and in shelters (tunnels) and above ground BW/CW production facilities. The second includes nuclear production facilities, such as reactors and separation facilities, and associated hardened, shallow-buried C3I facilities. The third includes deeply buried tunnels containing chemical and biological weapon production facilities and associated C3I facilities. In the case of the deeply buried targets, the objective is functional kill of the target. Technologies being developed fall into three categories: weapons, sensors, and planning/targeting tools. The new weapon technologies include enhanced payloads (incendiary and agent-defeat technologies) and an advanced warhead for defeating mobile missiles without producing collateral effects by destroying the BW/CW warheads. It also includes advanced penetrators such as the boosted penetrator to attack very hard targets and a miniature penetrator for precision strike against a nuclear facility (to force controlled shut-down). Improved precision guidance will also be developed for an improved precision strike capability. In the sensor area, advanced characterization and BDA sensors will be developed including chem, bio, nuclear, and electromagnetic UGS, 3D seismic/acoustic UGS, and void detection sensors such as gravimeters and magnetometers. Remote collateral effects sensors will also be developed. Sensors will be air-delivered, SOF-delivered, and on UAV platforms. DNAs targeting and collateral effects tools, MEA and HPAC, will be upgraded to provide predictions of the effects of the new munitions in the expanded target set and to provide new targeting methodologies for attacking this broader target set. This new technology will be developed during FY97-04 and will be demonstrated in Phase III of the CP ACTD in FY2000, in Phase IV in FY02, and in Phase V in FY04. Note that the CP II ACTD will not demønstrate a complete solution to the general problem of finding mobile missile launchers or buried WMD targets.

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Programmed DTO Funding ($M):

Program Element/Project	FY96	FY97	FY98	FY99	FY00	FY01
0603160D/P6539		5.0	37.2	42.1	43.3	50.0
Total		**5.0**	**37.2**	**42.1**	**43.3**	**50.0**

A. DEFENSE TECHNOLOGY OBJECTIVES FOR AIR PLATFORMS

AP.01.03.NF	Fighter/Attack Aircraft Technology
AP.02.12.NF	Airlift/Patrol/Bomber Aircraft Technology
AP.03.09.NF	Special Operations Forces Aircraft Technology
AP.04.00.AN	Helicopter Active Control Technology (HACT)
AP.06.00.NF	Fighter/Attack/Strike Propulsion
AP.07.00.ANF	Transport/Patrol/Helicopter Propulsion
AP.08.00.NF	Cruise Missile/Unmanned Air Vehicle Propulsion
AP.09.00.NF	Aircraft Power (MEA
AP.10.00.AN	Rotocraft Drive
AP.11.00.NF	High Speed Propulsion
AP.12.00.F	Hydrocarbon Scramjet Missile Propulsion (HyTech)
AP.13.00.F	High Temperature Fuels (JP-8+100/JP-90)

AP.01.03.NF Fighter/Attack Aircraft Technology. By 2005 Develop and demonstrate a set of aerodynamic, flight control, subsystems, structures, seabased support and integration technologies to yield a 30% reduction both in production costs at T-1 and support costs, a 45% reduction in IR signature, a 40% reduction in RF signature, a 25% reduced weight fraction, a 25% increased lift/drag ratio, a 35% reduction in development time, a 50% increase in reliability, a 15% reduced support volume, a 15% increased safety of launch and recovery operations, a 20% increase in longitudinal and lateral agility and a major reduction in vulnerable area, relative to F-22 and F-18E/F. This will be accomplished through a set of 6.2 programs and 6.3 demonstrations to overcome barriers such as providing alternate means of controlling tailless, low observable aircraft with advanced compact inlets and nozzles with no moving parts; affordable LO air data systems, reduce flight control system weight and related subsystems including secondary power while retaining performance and safety; developing a unitized structure with substantial part-count reduction; develop and demonstrate injection molded frameless transparencies; demonstrate passive stabilizer technologies for safe 700 KEAS crew escape; develop and demonstrate a common core of seabased support equipment to provide horizontal servicing for all seabased aircraft classes; provide real-time seabased aircraft approach information; demonstrate the integration of active aeroelastic structure with aerodynamics and flight control; demonstrate substantial tail buffet reduction through unsteady aerodynamics and demonstrate advanced agile aircraft air-to-air missile and fire control.

Key demos: FY98 - Next Generation Transparencies, Variable In-Flight Stability Aircraft, FY99-Extended Range Demo., Extended Life Tire, Electric Brake, High Horsepower Electric Actuator, FY00 Combat Flight Management part1, Active Aeroelastic Wing, FY01- Nozzle Flow Control, FY02-Electric Actuators, Advanced LO Air Data System, Multi-Ship Control, Affordable Composite Airframe, FY03-Self Adaptive Flight Control, Advanced Compact Inlet.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	96.0	148.1	103.1	78.3	80.0	80.3

AP.02.12.NF Airlift/Patrol/Bomber Aircraft Technology. By 2005 Develop and demonstrate a set of aerodynamic, flight control, subsystems, structures, seabased support and integration technologies to yield a 30% reduction in production costs at T-1 and a 35% reduction in support costs, a 30% reduction in IR signature, a 40% reduction in RF signature, a 25% reduced weight fraction, a 25% increased lift/drag ratio, a 35% reduction in development time, a 50% increase in reliability, a 15% reduced support volume, and a 20% increased payload flexibility (relative to C-17, P-3, and B-2). This will be accomplished through a set of 6.2 programs and 6.3 demonstrations to overcome barriers such as providing alternate means of deploying cargo through precision airdrop or on-load/off-load concepts; high lift systems with low observability; affordable LO air data systems, reduce flight control system weight and related subsystems including secondary power while retaining performance and safety; developing a unitized structure with substantial part-count reduction; develop and demonstrate injection molded frameless transparencies; develop and demonstrate a common core of seabased support equipment to provide horizontal servicing for all seabased aircraft classes; provide real-time seabased aircraft approach information.

Key demos: FY98- Next Generation Transparencies, Variable In-Flight Stability Aircraft, FY99-Extended Range Demo, Extended Life Tire, Electric Brake, High Horsepower Electric Actuator, FY01- Nozzle Flow Control, FY02-Electric Actuators, Advanced LO Air Data System, Multi-Ship Control, Affordable Composite Airframe, FY03-Self Adaptive Flight Control.

In addition to supporting the Joint Readiness, Joint Warfighting S&T Panel, this DTO supports Combat Identification, Precision Force, Electronic Warfare, Military operations in Urban Terrain, Dominant Battlespace Knowledge, Information Warfare, and Counter Proliferation.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	20.8	19.5	21.7	23.1	23.6	24.5

AP.03.09.NF Special Operations Forces Aircraft Technology. By 2005 Develop and demonstrate a set of aerodynamic, flight control, subsystems, structures, seabased support and integration technologies to yield a 30% reduction both in production costs at T-1 and support costs, a 40% reduction in IR signature, a 125% reduction in RF signature, a 35% reduced visual signature, a 75% reduced acoustic signature, a 25% reduced FWV weight fraction, a 20% increased lift/drag ratio, a 133% increased maximum trimmed lift coefficient at takeoff/landing conditions, a 30% reduction in development time, a 40% increase in reliability, a 15% reduced support volume, and a 15% increased safety of launch and recovery operations (relative to AC-130 and MC-130). This will be accomplished through a set of 6.2 programs and 6.3 demonstrations to overcome barriers such as nozzles with no moving parts; affordable LO air data systems, reducing flight control system weight and related subsystems including secondary power while retaining performance and safety; developing a unitized structure with substantial part-count reduction; develop and demonstrate injection molded frameless transparencies; develop and demonstrate a common core of seabased support equipment to provide horizontal servicing for SOF seabased aircraft classes; provide real-time seabased aircraft approach information; demonstrate the integration of active aeroelastic structure with aerodynamics and flight control; and demonstrate substantial tail buffet reduction through unsteady aerodynamics.

In addition to Military Operations in Urban Terrain, his DTO supports several Joint Warfighting S&T Plan Panels including Combat Identification, Precision Force, Electronic Warfare, Dominant Battlespace Knowledge, Information Warfare, Counter Proliferation, and Joint Readiness.

Key demos: FY98- Next Generation Transparencies, Variable In-Flight Stability Aircraft, FY99-Extended Range Demo, Extended Life Tire, Electric Brake, High Horsepower Electric Actuator, FY02-Electric Actuators, Advanced LO Air Data System, Multi-Ship Control, Affordable Composite Airframe, FY03-Self Adaptive Flight Control.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	13.2	12.6	13.8	14.6	14.9	15.5

AP.04.00.AN Helicopter Active Control Technology (HACT). By FY01, demonstrate via simulation Helicopter Active Control Technology (HACT) (i.e., second generation digital fly-by-light control systems, integrated fire/fuel/flight control, multi-mode Stability Control Augmentation System (SCAS) for carefree maneuvering) and define Handling Qualities (HQ) criteria for Joint Transport Rotorcraft (JTR). Demonstrate via flight test the integration of active control technology through application of systematic, robust control law design methods and fault tolerant architectures to: improve cargo and utility class rotorcraft slung load HQ to a Cooper-Harper Pilot Rating of 4, increase bandwidth 70% for gust rejection capability, improve weapon platform pointing accuracy 60%, and reduce envelope maneuvering margins 66%.

This supports the Joint Transport Rotorcraft (JTR) Advanced Technology Demonstration (ATD), upgrades to fielded systems, future advanced concepts, and civilian rotorcraft developments.

Performing project offices are the US Army Aeroflight dynamics Directorate, NASA Ames Research Center, Moffett Field, CA, and the US Army Aviation Applied Technology Directorate, Ft. Eustis, VA. Customers include the RAH-66 Comanche, the Joint Transport Rotorcraft (JTR), System Upgrades, future advanced concepts, dual use potential, EELS, CSS, and MTD Battle Labs.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	--	--	0.5	3.5	10.0	9.0

AP.06.00.NF Fighter/Attack/Strike Propulsion. Demonstrate, by 1997, a 60% increase in thrust/weight ratio, a 200^0F increase in combustor inlet temperature, and a 20% decrease in acquisition and maintenance costs from the 1987 state of the art via core demonstrations in the Advanced Turbine Engine Gas Generator effort and full engine demonstrations in the Joint Technology Demonstrator Engine effort. By 2003, demonstrate a 100% increase in thrust/weight ratio, a 400^0F increase in combustor inlet temperature, and a 35% reduction in acquisition and maintenance costs. Achieving these capabilities will increase aircraft payload by 50% or alternatively increase mission radius by 115%. In new aircraft (2003+) take-off weight is reduced by 35%, thereby significantly decreasing acquisition costs. Specific technology development areas include: increased aerothermodynamic design capability for improved component efficiency levels and control of heat transfer; higher temperature and lower density materials; innovative structural concepts; and compatibility of these developments with affordable manufacturing processes. Demonstrators will integrate these developments into engine configurations that will yield data on component performance, innovative structures, control systems, and use of advanced materials.

Technologies have both an excellent historical record of transition and many future transition opportunities. Examples of the latter include: near-term systems (F-22 upgrades, F/A-18E/F, JAST, HSCT, NASA Advanced Subsonic Technology and High-Speed Research), mid-term systems (F-22 improvements, JSF upgrades, V/STOL), and potential far-term systems (Global Strike A/C, Global Transport, Rapid Response Fighter). These systems will deliver payloads to address the needs of the warfighters as defined in the "Joint Warfighting S&T Plan" and the individual service's requirements documents. This defense technology objective supports numerous customers throughout the DoD to include Air Combat Command, Air Mobility Command, Air Education and Training Center, and Naval Air Systems Command.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	93.5	102.6	103.1	104.0	106.4	114.2

AP.07.00.ANF Transport/Patrol/Helicopter Propulsion. Demonstrate, by 1997, a 30% reduction in specific fuel consumption and a 80% increase in power/weight ratio from the 1987 state of the art via demonstrations in the Joint Turbine Advanced Gas Generator effort. By 2003, demonstrate a 40% reduction in specific fuel consumption and a 120% increase in power/weight ratio via similar demonstrations. Achieving these capabilities will provide a 200% increase in time-on-station for patrol/surveillance aircraft. Specific technology challenges are in the areas of component efficiencies, cycle temperatures, rotor speeds, component counts, lighter materials, and reduced leakage and chargeable cooling. Demonstrators will address these challenges in engine configurations that will demonstrate reduced leakage flows, control of circulation and cooling air in small blades and vanes, implementation of centrifugal impeller aerodynamics, and operation at high physical rotor speeds.

Technologies have both an excellent historical record of transition and many future transition opportunities. Examples of the latter include: near-term systems (SOA, ATT, advanced rotorcraft, V-22 growth, commercial aircraft), mid-term systems (RAH-66 upgrades, V-22 improvements, next generation rotorcraft, unmanned air vehicle, SOA upgrades); and potential far-term systems (advanced small transport, SOA V/STOL, advanced LAMPS). All these systems will deliver payloads to address the needs of the warfighters as defined in the "Joint Warfighting S&T Plan" and the individual service's requirements documents. This defense technology objective supports customers throughout the DoD to include Air Combat Command (rescue), Air Mobility Command, Naval Air Systems Command, and Army Aviation and Troop Command.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	15.7	15.9	15.7	17.7	18.9	19.6

AP.08.00.NF Cruise Missile/Unmanned Air Vehicle Propulsion. Demonstrate, by 1997, a 70% increase in thrust/airflow, a 30% reduction in specific fuel consumption, and a 45% acquisition cost reduction from the 1987 state of the art via demonstrations in the Joint Expendable Turbine Engine Concept effort. By 2003, demonstrate a 40% reduction in specific fuel consumption, a 100% increase in power/weight ratio, and a 60% reduction in cost. Achieving these capabilities will allow supersonic cruise missiles with over a 200% range increase over a rocket, and a 30% payload increase. This equates to a intercontinental range ALCM-sized missile. The technology challenges are similar to those for the other engine classes, except that the configurations and technologies are to address unmanned aircraft, limited life design criteria. The area of instrumentation requires special emphasis, due to the small size of these configurations.

Technologies have many future transition opportunities. Examples include: near-term systems (low cost standoff missile [JASSM], supersonic standoff weapon, longer loiter UAV, mid-term systems (advanced supersonic standoff weapon, long loiter UAV [Tier 2/Tier 3], P3I very low cost standoff weapon), and potential far-term systems (high speed intercept missile, very long range/long loiter UAVs, ultra low cost standoff weapon). All these systems will deliver payloads to address the needs of the warfighters as defined in the "Joint Warfighting S&T Plan" and the individual service's requirements documents. This defense technology objective supports numerous customers throughout the DoD to include Air Combat Command, Air Force Special Operations Command, Naval Air Systems Command, and Army Aviation and Troop Command.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	12.4	12.8	12.6	14.7	14.6	13.2

AP.09.00.NF Aircraft Power (MEA). By 1998, under an initiative called the More Electric Aircraft (MEA), eliminate the need for a central hydraulic system through electric power, demonstrating a 2.5-fold increase in reliability and a 50% reduction in engine bleed air. By 2005, demonstrate a 2-fold increase in Integrated Power Unit power densities, environmentally safe 28 Vdc batteries, 10-year 270 Vdc batteries, no airframe-mounted gearbox, 4-fold increase in electrical system reliability, and a 2-fold increase in power reliability for electric flight control and brake actuation systems. These improvements allow a 20% reduction in C-141 loads required to support the deployment of combat aircraft, due to reduced ground support equipment; a 15% reduction in maintenance manpower; and a 15% increase in sortie generation rate. The major technical challenge involves efforts directed toward improved performance and cost through the development of electrical power technologies. In the aircraft area, the primary challenge is highly reliable electrically-driven subsystems to replace reliability-plagued centralized hydraulics, pneumatics, and mechanically-driven engine gearbox subsystems. This concept integrates development of miniaturized power electronics, fault tolerant electric power distribution, long life energy storage, electric generators, electric motor drives/controllers, and electric actuator demonstrations. For rotary wing aircraft, the emphasis is on increasing power-to-weight ratio, reducing source noise, and increasing reliability of the large, main power transfer systems.

Predecessor technologies have had an excellent historical record of transition success. Recent examples include transition of battery technology to the E-8, electric components to the C-130J, and MEA Generation I power technologies to JAST. Additional mid-term transition opportunities include the C-5, JAST EMD, and C-130 systems. Electrical power technologies combine to provide cost effective, highly reliable power systems for all future platforms required to address the needs of the warfighters as defined in the "Joint Warfighting S&T Plan" and the individual service's requirements documents. This DTO supports customers throughout the DoD to include Air Combat Command, Air Mobility Command, Air Force Special Operations Command, Air Logistics Centers, Naval Air Systems Command, and Army Aviation and Troop Command.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	18.9	18.8	21.9	21.9	22.3	23.1

AP.10.00.AN Rotorcraft Drive. By 2000, demonstrate a 25% increase in power-to-weight of drive system, reduce noise by 10 db, and extend life by 12000 hours. By 2010, demonstrate a 40% increase in power-to-weight of drive system. Rotorcraft drive system payoffs include 15% range increase or a 25% payload increase for an AH-64 anti-armor mission, a 50% reduction in drive system maintenance per flight hour, with substantial improvement in system readiness. The drive system source noise reduction translates directly into increased crew/pilot endurance and efficiency in short term and reduced hearing loss in the long term. Achievement of the weight, life, and noise goals for rotorcraft drives requires the careful integration of each major component into the total rotorcraft drive system. Quieter, more reliable, higher power density rotorcraft drives are achieved through development of stronger/tougher high temperature steel alloys, innovative speed reducing/torque increasing mechanisms, unique clutch devices, and improved lubricants. These components, when demonstrated, will alloy for housing designs with higher load capacity, increased fatigue resistance, innovative structural configurations and reduces power loss from heat generation and vibration.

The rotorcraft drive system technologies are targeted for transition to all growth, enhanced, and future rotorcraft programs. In particular, these technologies can still impact production of the RAH-66 Comanche and operational upgrades of the AH-64 Apache, the CH-47D Chinook, the UH-60 Blackhawk, and the OH-58D Kiowa Warrior. In addition, advanced concepts such as the advanced cargo aircraft and the national transport rotorcraft, enhanced Apache and Bird Dog will see direct benefit from the completed demonstrations. These systems will address the needs of the warfighters as defined in the Army Modernization Planning Process and supports Army Aviation and Troop Command, and Naval Air Systems Command.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.1	2.4	4.5	9.0	7.0	0

AP.11.00.NF High Speed Propulsion. Demonstrate propulsion technologies that enable sustained flight at high-supersonic and hypersonic speeds. Propulsion cycles of interest include ramjet, scramjet, pulse detonation, and combined cycle (e.g., turbo-ramjet, turbo-scramjet). High speed propulsion is suitable for missiles and manned aircraft as well as Unmanned Air Vehicles (UAVs).

Ramjet and pulse detonation efforts will focus on low-cost, high-performance propulsion suitable for a broad flight speed regime (up to Mach 5). Scramjet efforts will focus on internal structures and flowpaths (in conjunction with DTO AP.12.00.F Hydrocarbon Scramjet Missile Propulsion). Combined cycle engine efforts will result in an integrated ground demonstrator, similar to the Joint Advanced Fighter Engine (JAFE) effort that led to the ATFE. The turbomachinery technology will be developed under AP.08.00.NF, Cruise Missile/Unmanned Air Vehicle Propulsion.

Demonstration goals to be achieved through ground tests (direct connect and freejet): By 1997, demonstrate an integral rocket/ramjet engine design that yields a 100% increase in total impulse, versus that of all-rocket propulsion systems, for AIM-120 and similar weapons. By 1999, demonstrate a ramjet engine for a bending airframe missile, leading to a weapon system demonstration (WE.17.02.N Low Cost Missile ATD). By 2000, demonstrate combined cycle propulsion technologies for +30% specific thrust and +20% thrust/weight relative to JETEC Phase III goals. By 2005, demonstrate an all-airbreathing propulsion cycle for air-to-air missiles.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	14.6	11.8	9.1	9.5	10.3	11.0

AP.12.00.F Hydrocarbon Scramjet Missile Propulsion (HyTech). By 2001, a freejet demonstration, achieving an Isp=850 sec with specific thrust = 60 lb_f/lb_m/sec @ M=8. Enhanced capabilities are referenced to the demonstrated state of the art for ramjet and scramjet (SCRJ) engines for missiles. Scramjet missile propulsion offers tremendous payoffs for future missile and aircraft applications addressing user-documented deficiencies in terms of range, timeliness, force multiplication, lethality, and survivability. Stand-off theater weapons using Mach 8 hydrocarbon fueled scramjet engines will provide a rapid response weapon capability to counter highly mobile "SCUD-type" weapons. By 2005, demonstrate double total impulse of a gun launched "rocket" via dual mode solid ramjet demonstrations. The challenge is to develop critical enabling hypersonic technologies required to support the development of hypersonic weapon systems. Required are simple, reliable high performance inlets that deliver high performance; combustors that deliver optimum performance; nozzle/expansion systems that provide thrust over the entire range of vehicle operation; and validated structural design methods, thermal loads, and materials and fabrication processes for propulsion flowpath components operating for extended periods above Mach 4.

Technologies have transition opportunities to include a Mach 8 hypersonic missile in the near-term, and subsequently a Mach 10 recce/strike aircraft. These systems will deliver weapon payloads to address the needs of the warfighters as defined in the "Joint Warfighting S&T Plan" and the individual service's requirements documents. This defense technology objective supports customers throughout the DoD to include Air Combat Command, Theater Missile Defense, Space Command, and Naval Air Systems Command.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	18.4	7.5	18.5	16.7	16.7	17.8

AP.13.00.F High Temperature Fuels *(JP-8+100/JP-900)*. Demonstrate, by 1998, JP-8+100 having a 100°F increase in thermal stability and a 50% increase in heat sink capability. By 2005, demonstrate JP-900 having a 5-fold increase in fuel cooling capacity and endothermic fuels having a 5- to 10-fold increase in fuel cooling capacity. Fuel enhanced capabilities are referenced to high heat sink hydrocarbon fuels (HHSH/CF) for reduced aircraft and engine fuel system maintenance costs due to fuel fouling/coking, improved fuel thermal stability. JP-8+100 offers a single fuel for the battlefield applicable to both air and ground vehicles while endothermic fuels provide sufficient air vehicle thermal management cooling capability to enable sustained hypersonic flight. The challenge is to develop critical enabling technologies required to support the development of high heat sink fuels for all services. Required are additives for fuels to suppress autooxidation and degradation mechanisms while maximizing available energy and providing adequate airframe cooling.

Technologies traditionally transition directly to all DoD weapon systems. Examples include: near-term systems (all current fleet aircraft), mid-term systems (IHPTET based propulsion systems, HyTech missile propulsion), and potential far-term systems (all advanced concepts). All these systems will rely on developed fuels to provide propulsive energy and cooling for weapon platforms to address the needs of the warfighters as defined in the "Joint Warfighting S&T Plan" and the individual service's requirements documents. This defense technology objective supports numerous customers throughout the DoD to include Air Combat Command, Air Force Special Operations Command, Air Mobility Command, Air Logistics Centers, Naval Air Systems Command, and Army Aviation and Troop Command.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	11.0	9.3	8.9	8.8	8.9	9.3

B. DEFENSE TECHNOLOGY OBJECTIVES
FOR CHEMICAL, BIOLOGICAL DEFENSE AND NUCLEAR

CB-01-10-D Integrated Biodetection ATD. By FY97, demonstrate biological point detection of biological agents using technologies such as DNA Probes, electrospray mass spectrometry, planar waveguides, and flow cytometry with more stable reagents and simpler identification chemistry. These technologies will provide an order-of-magnitude enhanced sensitivity to toxins and add a virus identification capability while providing significantly improved logistics, such as 10-fold increase in response times, trainable algorithms, 5x size/weight reductions, and increased environmental operating range. Also by FY98, demonstrate early warning biological agent detection and identification using technologies such as vibrational circular dichroism, Mueller matrix scattering, and the application of near-infrared and ultraviolet laser light scattering. By FY99, products will be demonstrated separately and as an integrated entry in future Battle Lab advanced warfighting experiments. Also by FY98, develop a combinatorial genetic super library for rapid selection of clones which produce high affinity antibodies against any potential biological threat agent. Antibody selection and products would be completed in weeks, rather than a year, at a 90% cost reduction and with far more flexibility than is possible with conventional testing.

Supports: Joint Service Biological Point Detection System (J-BPDS) and Joint Service Biological Standoff Detector System (J-BSDS).

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	13.1	14.6	15.5	15.8	0	0

CB-02-10-D Joint Warning and Reporting Network (JWARN). By FY00, demonstrate hardware and software to bring sensor information into the C4I system. This will provide commanders the situational awareness on current/projected chemical/biological warfare threats made available from the integration of sensor data to geographical and meteorological data and threat models. The network can be rapidly updated with the latest intelligence data. By FY98, identify, test, and characterize hardware and software required to provide the bridge from the warfare agent sensors to the C4I system. Using FY96 capabilities of MICAD, HAZWARN and VLSTRACK as the baseline, JWARN will have 10 to 100 fold increase in data telemetry (manipulation and transmission) capabilities and a threat model that can display the current status of threat along with a time-projection that is updated continuous with new sensor, geographical, meteorological, and intelligence data. By FY99, integration of hardware and software between the sensors and the C4I system through the use of an artificial intelligence that can statistical correlate and filter all the incoming data.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	--	0.3	0.7	0.7	2.1	2.2

CB-03-10-D Integrated Chemical and Biological Sensor Suite. By FY03, demonstrate chemical and biological point, and chemical standoff sensor technologies for use in unmanned vehicles (air and ground). This demonstration will identify the sensor technologies that will be used to make up the various sensor suite packages that will be utilized in the unmanned vehicles. The suite configuration will be determined by payload size and power requirements. Each candidate sensor will be configured in modular form to provide for rapid assembly (under 30 minutes) into the appropriate sensor suite configuration depending on the need and vehicle platform. By FY04, test and characterize capabilities of sensor systems on unmanned vehicles. A database of sensor module capabilities and characteristics will provide the user the optimal sensor suite configuration to meet his needs balanced against the unmanned platform capabilities. By FY05, delivery of a completed sensor suite package. Demonstrate the range of sensor configurations in the unmanned vehicles. By FY06, addition of bio standoff capabilities to the sensor suite package.

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Customer POC:
PM Unmanned Ground Vehicles
and PM Unmanned Aerial Vehicles

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	--	0.9	1.3	1.3	2.6	2.7

CB-04-10-D Joint Service Chemical Miniature Agent Detector (JSCMAD). By FY98, demonstrate breadboards for a pocket sized chemical agent detector based on technologies such as ion mobility spectrometry or surface acoustic wave sensors. By FY99, complete design for a small lightweight personal detector and begin building a brassboard. By FY00, deliver completed brassboard for testing and characterization. The small lightweight personal safety monitor will be capable of detection at less than incapacitating levels for nerve, blister, and choking agents, usable for 72 hour operations, weigh less than 2 lbs, fit inside battledress pockets, and have archival capabilities. By FY01, transition to 6.5 engineering manufacturing development (EMD) finalized brassboard system. This effort will provide for a range of Joint Service applications including early chemical detection and warning for personal safety, monitors for low level contamination of interiors of aircraft, ships, ground vehicles, and facilities and contaminated water, and as deployable remote sensors.

Supports: 21st Century Land Warrior, the GEN II Soldier ATD, Aircraft Interior Detector, and Shipboard Chemical Agent Monitor, Portable.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	1.8	1.4	3.1	4.0	0	0

CB-06-12-D Advanced Lightweight Chemical Protection. By the end of FY96, demonstrate the technical feasibility of eliminating/reducing carbon in the chemical protective ensemble through the use of advanced semipermeable membrane technology. The resulting advanced material system will be 20% lighter in weight than the standard FY96 battle dress overgarment material system, allow selective permeation of moisture while preventing passage of common vesicant agent, provide protection against penetration by toxic agents in aerosolized form, and provide at least the current level of protection against other toxic vapors and liquids. By the end of FY98, demonstrate via Dismounted Battlespace Battle Lab (DBBL) warfighting experiment and JSLIST II, the efficacy and durability of novel, lightweight chemical protective garments and clothing systems utilizing these agent impermeable membranes.

By FY98, develop and conduct physiological testing of a series of microencapsulated phase change materials (Micro PCMs). By FY99, conduct evaluations of MicroPCMs for use under chemical warfare overgarments for microclimate cooling and, with a different formulation, for microclimate heating. By FY01, Micro PCMs will be bonded to selected garments for field evaluation.

Supports: 21st Century Land Warrior, Air Warrior, Crew Warrior, Joint Service Lightweight Integrated Suit Technology II (JSLIST II), Advanced Development—Clothing and Equipment; Engineering Development—Clothing and Equipment.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	0.8	0.9	1.2	0.6	0.5	0

CB-07-10-D Laser Standoff Chemical Detection Technology. By FY99, reduce the size of the Joint Service Chemical Warning and Identification LIDAR Detector (JSCWILD) to a 2 cubic ft (40% reduction) hardened package. By FY03, demonstrate a JSCWILD brassboard with sufficient laser power and detector sensitivity to detect chemical agents at a distance of 20 km (400% increase from FY96 baseline). By FY04, demonstrate a brassboard with a wide band frequency agile laser in a compact package that can scan using multiple frequencies that is capable of detecting both chemical and biological agent. By FY07, reduce the size and weight of the integrated chemical biological LIDAR system by 60% in comparison to the current state of the art in FY97.

Supports: Joint Service Chemical Warning & Identification LIDAR Detector (JSWILD), Joint Service NBC Reconnaissance System (JSNBCRS), and Airbase and Shipboard Chemical and Biological Defense

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	1.3	0.5	0.8	0.8	8.7	7.9

CB-08-12-D Advanced Agent Filtration. Develop and demonstrate, using enhanced adsorbent and aerosol filtration technology, a light-weight, low-profile, low-resistance filter for future joint service respirator systems (i.e., RESPO 21 mask). In FY98, demonstrate form, fit, and function of a candidate filter design for incorporation into advanced mask prototypes capable of meeting C2 canister agent vapor and aerosol filtration requirements. In FY99, demonstrate a mask filter prototype capable of providing full-threat NBC protection while offering a 50% reduction in airflow resistance and a 33% reduction in overall size. By FY02, demonstrate a non-carbon based or self-decontaminating carbon chemical warfare agent vapor filtration system suitable for military collective and individual protection applications such as hospital shelters, ships, aircraft, armored vehicles, chemical warfare agent incinerator pollution abatement filters, and individual respirators. A non-carbon vapor filter element will eliminate any possibility of filter fire caused by upsets to other components of the environmental control sub-system, while retaining or improving the present chemical warfare agent protection properties of ASZM-T carbon. Several potential system concepts will be developed based on screening of candidate adsorbent materials, engineering design model development and trade studies. By FY04, demonstrate a total or partial replacement of the current adsorbent, ASZM-T carbon, using a modified collective protection filter integrated with an application such as armored vehicle or shelter.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	3.1	3.1	3.0	3.1	4.1	4.5

CB-09-12-D Decontamination for Global Reach. By FY97, determine the feasibility for large area decontamination and evaluate the need for decontamination of any validated chemical and biological threat agents at fixed sites, such as airfields, naval bases and depots, as well as civilian areas. By the end of FY02, demonstrate efficacy of enzymatic decontamination system for G and V-type nerve agents in foam based dispersion systems. By the end of FY03, identify a system that can be utilized to decontaminate Mustard (HD) and biological warfare agents. In FY04-05, incorporate the HD and biological warfare agent system into the foam matrix with enzymes identified for G and V-type agents. Develop, characterize and optimize the system for efficiency. During FY06, demonstrate the efficacy of the multi-agent decontamination system against a spectrum of CB agents.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	0.2	0.8	0.8	0.8	0.8	4.6

CB-10-07-H Nuclear Technology Development. In accordance with Presidential Decision Directive 15 and other national and Departmental guidance, develop the technologies needed to supplant nuclear testing and thus (1) ensure warranted confidence in the safety, security and effectiveness of the Nuclear Posture Review stockpile, and (2) validate system survivability/operability in the threat environments produced by proliferant weapons. Technology development/assessment focuses will include; collaboration with DOE labs for simulation of effects, achieving capability in system-scale effects simulation by increasing available fluence area products 400%, implementing major improvements in x-ray fidelity, improvements in plasma sources, a factor of 10 increase in debris-free soft x-ray testing, and a 50% increase in power flow efficiency and control for pulsed power sources. By FY96, deploy DoD stockpile revalidation teams to DOE physics labs and accomplish IOC for Large Blast/Thermal Simulator. By FY97, develop non-ideal airblast simulation capability at LB/TS and complete safety assessment for strategic aircraft. By FY98, transition new nuclear system physical security technologies to Air Force and Army and bring first quadrant of DECADE radiation simulator on-line (assuming favorable FY96 decision). Collaborate with DOE on stockpile revalidation through FY05. Credible nuclear capabilities are needed for accomplishment of JWSTP Counterproliferation and other objectives.

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Presidential Guidance for revalidation and effects simulation capabilities; Chairman, JCS for revalidation/ certification; development system-specific customers for survivability validation and physical security

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	53.9	50.2	55.9	52.9	49.9	48.2

CB-11-07-H Planning Systems for Contingencies Involving Proliferants. Develop and transfer to operational commands a suite of automated planning support systems responsive to warfighter requirements for operational planning and targeting assessments in contingencies involving WMD proliferant antagonists. By FY98, complete transfer of new planning systems to NATO. Commencing in FY96, implement direct technical modeling and simulation center responsive to CINC requirements, and initiate development of Intelligent Target Interface and NATO nuclear planning system trainer project; automate JCS nuclear targeting publication Joint Pub. 3-12.2, giving particular emphasis to minimization of collateral effects and maximizing survivability of deployed forces. Effort responds to Joint Warfighting S&T Plan Counterproliferation and Precision Force objectives by significantly improving warfighters' capabilities for assessing attack options and collateral hazards during contingency planning and operations. SHAPE support is responsive to Joint Readiness objectives. Customer feedback concerning responsiveness to customer-defined requirements is the primary measure-of-effectiveness. Program develops previously unavailable tools for new types of contingencies to enable precision targeting with minimal collateral effects. A primary technical challenge is to develop, validate (with customers), and implement automated planning support systems responsive to new contingency requirements, notably the need for precision delivery of limited numbers of munitions, and the emphasis given to prediction and minimization of collateral hazards.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	8.9	11.7	13.7	15.8	16.0	16.8

CB-12-01-H Electronic System Radiation Hardening. Develop enabling technology to provide the means to produce affordable state-of-the-art radiation hardened microelectronics to enable DoD systems to survive and perform their mission in natural and nuclear weapons generated radiation environments. This program is the only DoD source of enabling technology for highly integrated and high performance microelectronics capable of withstanding the very severe radiation environments associated with nuclear threats. Program addresses the continuous need for missile and space systems to have increased information processing capability within size, weight, survivability and cost constraints. This is accomplished through use of static random access memories (SRAM) as the technology demonstration vehicle for the enabling technology to produce a broad range of radiation hardened digital and analog microelectronics.

Specific technology objectives include: by FY98, demonstrate, test, and evaluate radiation hardened silicon-on-insulator analog microelectronics, allowing a 5 times reduction in the size and weight of sensor electronics; by FY99 demonstrate prototype radiation hardened 4 M SRAM technology for a factor of 16 improvement in power and weight; by FY00, demonstrate the technology for radiation hardened low-power 1000k gate array and 16 M SRAM technology, leading to two orders of magnitude advance in performance and reduction in power and weight. In short, this program develops the enabling technology for critical path radiation tolerant items essential for the Space Based Infrared System (SBIRS) and USSTRATCOM priority weapon systems and C4I systems. This enabling technology forms the basis from which DTO SE.26.01 AFH, Radiation Resistant Microelectronics, in the Electronics TAP produces final products with System Program Office funds.

Survivable space-based systems are preconditions for accomplishing the Joint Warfighting S&T Plan objectives of Dominant Battlespace Knowledge and prevailing in Information Warfare. The key technical barrier is that each succeeding generation of commercial microelectronics becomes increasingly susceptible to radiation. DoD must therefore maintain an ongoing effort to radiation harden new generations of microelectronics as they evolve to ensure that future warfighters have the survivable state-of-the-art electronics systems needed to complete their missions. Program priority directed by Dr. Jones, DDR&E.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	24.3	20.7	22.0	21.9	25.1	27.2

CB-13-07-H Hard Target Defeat. Develop the technology base required to characterize, defeat or disrupt, and assess battle damage for buried and/or hardened targets, particularly targets containing WMD. By FY98, accomplish testing to demonstrate and assess options for functional kill of hardened NBC and C3I facilities. Technologies are lacking for target characterization and conventional defeat or functional kill of some hardened targets. The Joint Warfighting S&T Plan Counterproliferation objective specifically includes counterforce defeat of hardened WMD storage and production facilities. Defeat of underground targets was a top priority (number 3 of 14) as defined by the warfighting CINCs (Counterproliferation Program Review Committee Report to Congress, 1995, pg. 27).

Technical issues differ for two classes of hardened targets. The first are surface and shallow buried facilities that are more susceptible to defeat, but which may generate unacceptable collateral effects if attacked with conventional munitions. The second set consists of deeply buried targets, a number of which cannot be physically defeated with current conventional munitions, but may be subject to functional disruption; collateral effects are of lesser concern when these targets are engaged with conventional weapons. Target characterization and battle damage assessment are problems for both sets. A variety of weapon options and damage/disruption mechanisms will be evaluated.

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Dr. Goering DNA (703) 325-7140 Mr. Holm DNA (703) 325-0818	Dr. Smith ATSD(AE) (703) 697-5161	Responsive to priority defined by CINCs and JCS

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	7.9	5.6	10.5	12.2	13.7	14.4

CB-14-07-H Prediction and Mitigation of Collateral Hazards. Establish the capability to accurately predict in an operationally suitable manner the effects on both civilian and military populations of WMD hazards released into the atmosphere due to battlefield WMD use or to conventional counterforce attacks on WMD facilities. FY96 IOC for Hazard Prediction and Assessment Capability. By FY99, demonstrate significant improvement in ability for long-range high-resolution forecasting of WMD hazards. Specific technical challenges/objectives are (1) prediction/mitigation of effluence from breached targets, (2) integrated capability for high resolution mesoscale weather prediction, (3) extended capability to model non-weapon-related sources (including accidents and terrorist devices), (4) ability to calculate mass consistent wind fields, (5) use of such calculations to accurately predict transport and to track very low concentrations over long (1,000km+) ranges, and (6) calculate mean depositions and probabilities of detection or kill. Host on multiple platforms, PC through mainframe. This program responds to two of the Joint Warfighting S&T Plan Objectives - Counterproliferation (in which planning tools for collateral damage assessment are specifically identified as requirements) and Chemical-Biological Detection (the Joint Warfighting S&T Plan identifies the capability for standoff detection of biological agents as the single most pressing requirement). Detection and characterization of agent hazards was the top priority defined by CINC warfighters in their articulation of unmet mission requirements (Counterproliferation Program Review Committee Report to Congress, 1995, p. 27).

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Responds to CINC priority.
USEUCOM is partner for ACTD that includes preliminary demonstrations of this capability.

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	4.4	5.2	5.8	5.8	6.0	5.5

CB-15-01-H Balanced Electromagnetic Hardening Technology. This is a not fully funded program that responds to requirements identified by JCS/J-6 and USD(A&T). A minimum/baseline program would, by FY01, develop and demonstrate innovative, affordable technology and methodologies for integrated hardening and testing of military systems against High Power Microwave (HPM) and High Altitude Electromagnetic Pulse (HEMP) effects. Integrated hardening against multiple battlefield threat environments, e.g., HPM and HEMP, will reduce hardening cost, size/weight, procurement (design and test time), and provide residual protection against other electromagnetic threats, e.g., indirect lightning. Target hardening cost reductions of 15-20 percent are expected, plus weight reductions of up to 30 percent if composite shielding materials become realizable. Cost savings of 20-25 percent over the lifetime of a system are also expected with the improved testing and maintenance/surveillance methodologies developed under this program. An integrated approach to hardening against a range of effects is both more cost-effective and prudent given the anticipated increased use of commercial parts and specifications in DoD acquisitions and wider frequency range of possible battlefield electromagnetic environments. Using the same rationale, a more comprehensive program (as proposed by the Army, but completely unfunded) would accomplish the following: by FY96, define proliferant threat scenario systems to be deployed in 2005+, and test facilities available; by FY97, complete life cycle milestone planning for integrated protection of systems and conduct initial tests to validate new protocol for hardening; by FY98, define requirements for protection protocol improvements and develop/distribute software to assist system developers in achieving integrated protection; and by FY99, finish application of complete integrated protection protocol on deployed system.

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Customer POC:
Responds to requirements identified by JCS/J-6 and USD(A&T)

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	5.0	2.7	2.7	2.9	2.8	2.9

C. DEFENSE TECHNOLOGY OBJECTIVES FOR INFORMATION SYSTEMS AND TECHNOLOGY

IS.01.01.ANE	Consistent Battlespace Understanding (Joint Battlespace Awareness)
IS.02.01.AFNE	Forecasting, Planning and Resource Allocation
IS.03.301.ANE	Integrated Force Management
IS.10.01.AD	Simulation Interconnection
IS.11.01.ADE	Simulation Information Technologies
IS.12.01.ADC	Simulation Representation
IS.13.01.AD	Simulation Interface
IS.15.01.NFE	Global C4 Information System Infrastructure
IS.16.02.E	Portable Command and Control for the Joint Task Force
IS.17.02.NFEG	Defensive Information Warfare
IS.18.02.FE	Survivable Information Systems
IS.19.06.AFE	Context Based Information Distribution
IS.20.01.AFNC	Universal Transaction Communications
IS.21.01.AFE	Assured Communications
IS.22.01.AFNE	Network Management
IS.23.01.AFNC	Digital Warfighter Communications
IS.24.01.AFE	Multiband, Multimode Information System
IS.26.02.E	Advanced System Architecture Technology
IS.27.02.ANFE	Knowledge.Based Design
IS.28.02.FE	Intelligent Information Technology
IS.29.02.NFE	Software Technology for High Performance Computing
IS.30.02.AFNE	Advanced Embedded Software/System Engineering Technology
IS.31.02.NE	Intelligent Control
IS.32.02.NFE	Information Presentation and Interaction
IS.33.02.NE	Embedded High Performance Computing

IS0101ANE Consistent Battlespace Understanding (Joint Battlespace Awareness). Goal: Provide warfighters critical information, and an elevated level of understanding of enemy, friendly, geo-spatial and feature information while maintaining consistency of that view across fighting and supporting forces. Provide capabilities to organize, assess quality, deconflict, handle uncertainty, and present available information in order to insure the consistency of battlefield understanding across all echelons.

By FY98 develop and demonstrate a JTF Battlespace Awareness and Visualization capability (CINC/CJTF to lower echelons) which provides a consistent, accurate, comprehensive and timely Battlespace picture (C2, INTE L, LOG, Weather, Obstacle, etc). This picture provides selectable detail and resolution, and links to remote information to continuously acquire and fuse multi-sensor, multi-media data with levels of uncertainty. This capability includes cognitive support and decision aids, 2D/3D Battlespace Visualization, collaborative capabilities, and automated fusion analysis and forecasting of information, including Battle Damage Assessment. Consistent Battlespace Understanding is supported by automated data validation and validity tags, intelligent agents for information retrieval, filtering and deconfliction, and mission tailored presentation and large, distributed databases. This includes providing cueing to CAI systems, containing information necessary to resolve uncertainty and improve understanding. This initiative overcomes current limitations in the management and display tactical information (tabular, spatial, operational, etc). Consistent Battlespace Understanding facilitates rapid, effective decisions on the Joint Battlefield resulting in 50% improved force synchronization, 20% reduced casualties and faster realization of operational objectives. Consistent Battlespace Understanding will benefit CINC/JTF Commanders and staff, and enable them to exploit and shape the battlespace so as to fight on their own terms.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	39.8	62.8	62.8	61.6	50.4	20.5

IS0201AFNE Forecasting, Planning and Resource Allocation. Goal: To provide warfighters the ability to be proactive in the planning process, to avoid direct conflict and to be prepared to act and react should conflict prove inevitable. Provide capability (when conflict occurs), to fuse and assess data, deconflict info from different sources, and plan the allocation and reassignment of resources (logistics, sensors, etc.), to shape expected actions within the enemy's decision cycle and keep him out of ours.

By FY97, provide objectives to task Monitor Air Attack Plan enabling strategic replanning of the ACP in minutes rather than hours. By FY98 develop and demonstrate an automated real time capability to analyze and select alternative courses of action, construct forecasts, prioritize critical objectives, and develop plans to permit rapid rehearsal and evaluation of Battlespace options (5 times the # of COA's in 10% of the time for joint ops plans). Planning will be continuous and will leverage the development of intelligent agents to initiate and sustain planning and forecasting. This development includes collaborative, distributed planning and scheduling, automated target/shooter pairing, smart alerts, and interactive wargaming as an integral part of the rehearsal process. By FY98 generate at least 80% of the ATO automatically and reschedule tanker/airlift operations in 15% of current timelines. BY FY99 reduce the in theatre footprint of the JFAAC AOC by 60%. By FY00, reduce the Tanker/airlift Control Center staff by 40%. This capability will dramatically improve the Warfighter's ability to anticipate, prepare and respond to dynamic, uncertain Battlespace situations and events. The Forecasting, Planning and Resource Allocation initiative overcomes the manual, time-consuming and unreliable planning and rehearsal process employed today. It will dramatically reduce cycle times and deny the enemy the time and means to respond. As the complexity and temp of the Battlespace increases, the value of the Forecasting, Planning and Resource Allocation DTO will manifest itself in 20% reduced casualties and fratricide, and a 50% reduction in planning/replanning time. This initiative benefits CINC\ JTF Commanders and staff.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	36.1	45.2	53.0	49.4	45.7	39.3

IS0301ANE Integrated Force Management. Goal: Provide warfighters the ability to accomplish dynamic, continuous synchronization of Force operations through collaborative execution monitoring, plan-repair and retasking of shared assets across echelons, missions and forces. This DTO is inextricably linked to the Forecasting, Planning and Resource Allocation DTO in that it will add “dynamic” synchronization and direction to accomplish those functions in real time, for simultaneous, continuous operations. Implement capability to perform wargaming at faster-than real time.

By FY98 develop & demonstrate the capability to collaboratively execute plans, synchronize forces and monitor tactical operations across joint forces. This includes plan deconfliction dynamic plan repair/modification and re-synchronization of joint forces. By FY99, provide integrated Force Management includes distributed, collaborative situation awareness, dynamic shared warplanning that deals with uncertainty, decision support for the spectrum of C4I operations, and continuous allocation of shared resources (logistics, sensors, etc.). Fully coordinated operations across the force will result in faster adjustment of mission plans in a dynamic tactical environment, a 20% reduction in casualties and fratricide, and a 50% improvement in force synchronization. This initiative enables the warfighter to overcome the manual, unsynchronized and time consuming processes employed today to coordinate, execute & adapt simultaneous operations.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	12.1	9.1	5.9	8.6	8.7	7.8

IS1001AD Simulation Interconnection. Goal: Satisfy the need within DoD to provide a capability that will allow models and simulations that were developed independently to support training, acquisition, and analysis to interoperate. In addition to interoperability and simulation component reusability, this new capability must assure consistent and reliable results.

For interconnection, the major technical challenges include: (1) establishing the architectural design, protocols and standards, multi-level security, and use of dynamic multicast groups for the interoperability of simulations, (2) providing the maximum possible interoperability among simulations at different levels of resolution and (3) establishing common application gateways (M&S surrogates) and time management services to all simulations.

The key element of this new capability is the development of a high level architecture and a run time infrastructure to be prototyped and demonstrated in FY96. In FY97, a second version of prototypes will be used to test the run time infrastructure along with the development of a high level architecture compliance test process. In order to fully implement the Objective, development of new network communications services, application support services, new protocols and standards, and the application of dynamic multicast grouping technologies will be required. This effort will begin in FY97 and will be completed in FY01. These efforts will support the Synthetic Theater of War (STOW 97) ACTD.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	24.1	22.7	26.0	27.2	28.3	29.6

IS1101ADE Simulation Information Technologies. Goal: Provide the Services and all other government agencies the ability to develop models that provide consistent and reliable results through the development of common conceptual models of the mission space using authoritative representations of functional roles and responsibilities. In addition, the methods for formulating and defining data structures, dictionaries, and enumerations of complex data will be required. The Objective will also result in the development of a modeling and simulation resource repository; and verification, validation, and accreditation standards and guidelines. Developing coherent, complete, and consistent conceptual models of the mission space is a difficult task. DoD M&S spans a wide range of missions (from conventional to other than war missions) and M&S applications (from system acquisition activities to mission planning and rehearsal). The need for valid quantitative assessments of effectiveness and performance will lead to the collection of classified data. The distributed and interactive nature of advanced M&S capability makes the standardization and securing of data an extremely complex technical concern.

In FY97, the initial version of conceptual models of the mission space will be fielded. Pilot studies of modeling and simulation verification, validation, and accreditation procedures and guidelines will be initiated. In FY97, pilot studies on data security will be completed. Techniques for modeling complex data structures (e.g., highly derived data, command hierarchies, artifacts of legacy systems, etc.) initiated in FY96, will be demonstrated and completed in FY00. These new capabilities will be focused on supporting modeling and simulation system developers. These efforts will also support the Synthetic Theater of War (STOW 97) ACTD.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	29.2	19.6	17.1	18.6	19.1	20.8

IS1201ADC Simulation Representation. Goal: Provide authoritative representations of: (1) human and group behaviors, (2) the performance and capabilities of warfighting systems, and (3) the effects of the natural, natural disturbed, and manmade environment on human and system performance to enhance the realism of models and simulations used in military training, acquisition, and analysis. Representations of terrain, the ocean, the atmosphere, and space must span large and diverse regions and must account for a large number of significant conditions and effects. Major challenges include the rapid generation of and near real time interaction of these representations. The representation of human behavior must reflect human capabilities, limitations, and conditions that influence behavior (e.g., morale, stress, fatigue). Providing *variable* human behavior for friendly, enemy, and non-hostile personnel remains a significant challenge. The initial focus of this objective will be on the development and demonstration of the capability to rapidly generate terrain databases.

In FY97, this capability will provide enhanced representations of rapidly generated terrain databases to support a 72 hour crisis rehearsal. System representations, under development by the Services, will continue through FY97. Demonstrations of enhanced system representations will begin in FY98. In FY96, a human behavior taxonomy will be developed as well as the establishment of a Warfighter distributed test bed. In FY97, tools and techniques used to acquire knowledge of individual performance will be developed.

These efforts will support the Synthetic Theater of War (STOW 97) ACTD, as well as Joint M&S system developments like JSIMS, JWARS, JCOS, and JLOTS.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	28.7	19.4	25.7	27.8	27.5	28.1

IS1301AD Simulation Interface. Goal: Provide simulation interfaces for the seamless integration of M&S with real-world C4I systems, instrumented live systems and vehicles, test and training ranges, the design and acquisition process, and humans. These interface technologies will allow for increased information data exchange for collaborative operational planning, enhanced training, cost effective design and manufacturing, and the representation of live systems/humans in distributed simulations. Interfaces between live systems and synthetic environments must overcome two problems: (1) the interfaces between live systems and synthetic environments must be responsive and complete, and, (2) the accurate representations of live systems in synthetic environments and synthetic forces in live systems. A key challenge for supporting training while on the move is providing responsive interfaces to synthetic environments for personnel using real-world C4I systems. The use of distributed M&S capability to support training while on the move inherits the challenges of providing sufficient bandwidth, capability, and realistic environments to widely distributed personnel. The locations and orientations of live players/systems are needed to accurately represent them in a synthetic environment. Information received from sensors and full-body trackers is needed to adjust the presented visual scene of the live player. Inaccurate or delayed tracking can induce virtual reality sickness (akin to motion sickness). Improvements in measurement resolution, accuracy, and responsiveness are needed to promote improvements in aids to visualization.

In FY97, the interface with real-world C4I systems will include a demonstration of automated weapon and target pairing, as well as the initial development of a fully integrated live/virtual command and control network. The interface with live systems and vehicles will require the development of a DoD high-level simulation architecture (HLA) run time infrastructure (RTI) live system modular reconfigurable C4I interface (MRCI). The MRCI will be demonstrated in FY97, and will be applicable for training, acquisition, and analysis. Design and manufacturing interfaces will depend on the integration of commercially developed data exchange protocols for computer aided design and manufacturing tools with military simulations. Initial demonstrations of this capability will begin in FY-98. These efforts will also support the Rapid Force Projection Initiative (RFPI) ACTD.

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<u>Customer POC:</u>
The Warfighter; all service and agency M&S users; all M&S developers

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	14.2	17.6	20.8	17.9	14.2	14.4

IS1501NFE Global C4 Information System Infrastructure. Goal: Develop and demonstrate a globally distributed heterogeneous information infrastructure to provide warfighters at all echelons immediate and location transparent access to any information required to prosecute the battle. It may be derived from multi terabyte databases spread over a thousand nodes, and involve execution and sharing of up to a half million processes supporting all phases of the mission planning and execution. It will be dynamically reconfigurable to accommodate crisis loads, outages or changes in information needs. It will provide for the integration of facilities with ADP and communications system, plus associated information services and applications as described in the Advanced Battlespace Information System(ABIS) "grid."

By FY97 demonstrate heterogeneous distributed computing incorporating multi media data, shared context collaboration, video conferencing and intelligent agent based data acquisition over wide area networks. By FY98 demonstrate incorporation of mobile computing nodes into the infrastructure. This includes the operation over lower bandwidth, more error prone communication channels. protocols to allow entry/departure and re-entry into the configuration; resource management mechanisms to allow allocation and binding of processes and data across the hybrid fixed/mobile configuration. By FY00 demonstrate adaptive reconfiguration of a 100 node infrastructure to support dynamic crisis response. Technical Barrier: Uniform and timely global access to applications and data.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Les Anderson	Virginia L. Castor	TBD
USN NCCOSC RDTE Division	DDR&E	
(NRaD)	(703) 695-0005	
619-553-4139		

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	31.9	35.6	29.1	36.0	35.1	40.1

IS1602E Portable Command and Control for the Joint Task Force. Goal: Develop and demonstrate a supportable, global C2 capability which will provide distributed generation, analysis, rehearsal and execution of joint strike plans and crisis action plans in a joint task force environment.

This program will develop and use an advanced architecture based on Object Oriented technologies and Distributed Computing Environments.

By FY97 demonstrate geographically distributed, highly collaborative, time sensitive plan generation and analysis. Capability will be integrated with an ultra high performance global network and access to High Performance Computing sites to provide universal access. By FY98, in conjunction with the Advanced Joint Planning ACTD, provide a "leave in place" prototype capability for USPACOM, USACOM and USEUCOM and US FORK. Technical Barrier: Establishing and advanced object oriented architecture that will support portable systems for the commander of JTF.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Dr. John Schill	Virginia L. Castor	Mr. Jens Jensen
DARPA (ISO)	DDR&E	USPACOM
Tel: TBD	(703) 695-0005	Tel: TBD

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	9.8	11.5	25.0	50.0	85.0	107.1

IS1702NFEG Defensive Information Warfare. Goal: Develop and demonstrate the technology which provides that degree of control in information functions that permits friendly forces to operate at a given time and place without prohibitive interference by the opposing force. From a defensive point of view this includes the preservation of the access control, authentication and integrity of information and the military systems containing the information. In addition to the performance characteristics of the Global Information Infrastructure, the attributes to be obtained are protection of a global communications grid against both overt and covert threats, mandatory and discretionary access control across multiple levels of classified data, and correct, consistent non corrupted data across multiple distributed databases. The need for multi level information system security exists in all types operational systems (e.g., command, control, execution monitoring, weapon system) as well as all types of support systems (e.g., logistics, transportation, training and rehearsal, modeling and simulation etc.).

By FY97 demonstrate the ability to secure a locally distributed, real time computing cluster, and an object oriented database management system. Demonstrate response tools to detect corrupted code and signs of penetration. By FY98 demonstrate the ability to secure Internetted clusters of COTS based, heterogeneous computing elements. Demonstrate tools which (1) support global policy enforcement across platforms with different security mechanisms, and (2) support the development of adaptive policies which can respond to changing system dynamics without compromising security attributes. Technical Barrier: Assure confidentiality and integrity of data at multiple classification levels in systems accessed by users with different clearances and needs-to-know.

Svc/Agency POC:
Mr. Les Anderson
NCCOSC RDTE DIV (NRAD)
619-553-4139

USD(A&T) POC:
Virginia L. Castor
DDR&E
(703) 695-0005

Customer POC:
TBD

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	19.5	26.8	35.6	35.0	24.9	25.0

IS1802FE Survivable Information Systems. Goal: Develop and demonstrate technology to guarantee the availability and integrity of the information system to support the warfighter in a dynamic battlefield environment. Monitor the status of performance of and health of the system relative to an objective policy and modify allocation of resources to accommodate any changes or anomalous behavior. Provide graceful degradation of performance for systems under attack, and assure that as resources are depleted, they are dynamically allocated to the highest priority mission support. Increase the number and type of faults which the information system can tolerate, and minimize the recovery time and residual effects of the recovery mechanisms.

By FY97 demonstrate the ability to dynamically select and apply fault avoidance/fault recovery mechanisms using intelligent agents which monitor system status. By FY99 demonstrate graceful degradation by dynamically reallocating computing resources to critical processes in a diminished resource set resulting from failures or hostile action. Technical Barrier: Survivability and graceful degradation of mission functions in a failure prone and hostile environment.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. Les C. Anderson	Virginia L. Castor	TBD
NCCOSC RDTE DIV (NRAD)	DDR&E	
619-553-4139	(703) 695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	11.4	13.5	11.1	11.1	11.8	14.0

IS19I06AFE Context Based Information Distribution. Goal: To investigate and develop concepts and techniques for automating the distribution of information across all military echelons and environments, to include the individual warrior. It will use computationally intensive model-based (rather than communications intensive message-based), paradigms which will relieve warriors of the mundane and tedious tasks required to distribute information, and allow them to concentrate on their warfighting missions. In a context-based command and control (CBC2) scheme, the data model, and its container, the database, becomes the conduit by which information is transferred between different units. Every unit in the force maintains its own copy of the battlefield model in its local computing environment. Application programs reside between the model and the end-user to convert the information into a form appropriate for the situation. This paradigm provides several advantages (1) it allows active database techniques to be applied to automate and control the flow of information via predefined criteria (2) the information is exchanged directly between the databases bypassing the need to convert to “message types.”

FY97: Develop adaptive information distribution processes based on active database technology that allows information exchange requirements to vary automatically in constrained environments. FY98: Develop model-based robust recovery techniques to respond to anomalies and provide real-time display of recovery process. FY00: Demonstrate scalability of CBC2 to large systems of mobile/portable computers to provide situational awareness and interoperable C2 on the move in bandwidth constrained environments. Technical Barrier: The ability to use information context and military echelon cognizance to intelligently filter and distribute information to the battlefield using available communications resources.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. Les C. Anderson	Virginia L. Castor	TBD
NCCOSC RDTE DIV	DDR&E	
(NRAD)	(703) 695-0005	
(619) 553-4139		

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	9.2	17.2	14.0	44.0	4.6	4.9

IS2001AFNC Universal Transaction Communications. Goal: Provide warfighters the ability to exchange information, unimpeded by differences in connectivity: natural, natural disturbed, and manmade environment; and interface characteristics. Enhance dissemination throughput and connectivity to meet most warfighter needs; provide fully integrated asymmetric services; provide high capacity flexible tactical communication extensions to serve all categories of uses (including mobile); develop universal transaction protocols and standards providing seamless connectivity across multiple media; and provide automated features to mitigate the effects of manmade and naturally disturbed environments on wireless communications. Demonstrate scaleable networks that can support wireless access across multiple mobile. Throughout all programs apply commercial standards and protocols to deliver self adapting, rapidly deployable tactical mobile networks.

By FY97 demonstrate the feasibility of having a high density of users be able to retrieve multimedia information from network servers through a low cost wireless, ultra lightweight terminal. By FY97 demonstrate wireless transceiver technology supporting 64 Kbps to 155 Mbps at frequencies up to 2.4 Ghz (supporting speed corresponding to many common standards). By FY98 demonstrate Wireless Internet Gateways (WINGS) needed to enable seamless marriage of distributed, dynamic, self organizing, multihop, wireless networks with emerging multimedia internet. By FY98 demonstrate scaleable architecture that can support wireless access across multiple overlay networks (BARWAN) while delivering high levels of end to end performance. By FY98 demonstrate a prototype LEO payload to support Direct Broadcast Satellite using an adaptive spread Aloha protocol. By FY98 demonstrate wireless communications technologies (dual use) in the areas of Hand Held Multimedia, Multihop Radio, Intelligent Information Servers, and miniature filters and by FY98 demonstrate the ability to support real time applications (including video) using the Real Time Internet Protocol in a digital Wireless Communications Government/Industry Test Bed. Demonstrate 10 times data rate increase for selected untethered subscriber communities by FY98. Extend access to the ATM global grid to all warfighters using GBS and emerging mobile commercial services by FY99. This will enable the warfighter to develop concepts and plans without imposing a priori constraints on their thought processes by providing seamless connectivity; automatic adaptive information conditioning; location independent, personal and group addressing; and flexible adaptive access control. Technical barriers associated with this DTO include protocols and network control for a high population, high capacity mobile network; null steering antennae algorithms; multimedia over low data rate channels.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Kevin Mills	Virginia L. Castor	TBD
DARPA	DDR&E	
(703) 696-8945	(703) 695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	14.8	22.3	19.1	18.3	13.6	14.0

IS2101AFE Assured Communications. Goal: Provide high quality services that the Warfighters can be assured will be available whenever and wherever needed, that can be adapted, scaled and projected to meet dynamically changing demands, and can be defended against physical and Information Warfare threats. Provide modular plug and play for C4I commensurate with force package modularity to allow adaptation of services. Enhance ability to support multi-level security. Provide defensive Information Warfare to assure active and passive Information protection. Detect and characterize attacks at the network and lower transport layers. Demonstrate information warfare surveillance and defense tools to detect, classify, and respond to IW attacks. Integrate existing information security devices to provide a suite of operational capabilities for joint and coalition operations.

By FY97 demonstrate secure guards and firewalls at B3 level of service. In FY97 Multi-Level Security requirements will be addressed by the insertion of TEED hardware into TFXXI. TEEDs to support the tactical IP Internetwork are projected to be available by testing with Intel and logistics users in FY97. Following successful development and testing, TEEDS will be upgraded to support ATM cell encryption using Baton technology in FY98. By FY98, cell agile FASTLANE encryption devices will be exploited in joint service testing. This will provide the Warfighter with a high degree of confidence that he will have connectivity to whomever and wherever he needs it throughout the phases of the battle, with no attention to different operational levels of security. It will support global logistics information and tracking of warfighter resources in real time. Global connectivity in support of M&S needs is also supported by this DTO.

Svc/Agency POC:
Kathy Dunn, NSA

USD(A&T) POC:
Virginia L. Castor
DDR&E
(703) 695-0005

Customer POC:
TBD

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	15.5	18.2	21.8	27.9	31.0	21.8

IS2201AFNE Network Management. Goal: Provide responsive, dynamic, anticipatory grid management with the ability to advise on the current and operational mission support capability. Provide full visibility of management decision alternatives on all elements of the grid, from strategic and operational through tactical. Provide full near and real time visualization of current and projected status of the grid across all domains. Develop network management technology which provides a robust theater-level capability in support of Joint service needs in theater. Provide improved utilization of network resources through interworking with public switched networks. Provide peer-to-peer management with existing domain managers. Develop network management performance optimization algorithms capable of dynamically adapting to changes in network resources and information flow requirements. Provide robust management of network infrastructure to deliver priority ordered, graceful degradation, and service restoration after outages. Develop metrics and algorithms to detect surreptitious behavior within the network and strategies to mitigate their effect.

By FY96 provide SNMP control IP networks in Navy's Joint Maritime Communication System (JMCOMS) program. By FY97 demonstrate dynamic planning, monitoring, and adaptation of communication networks, incorporating Automated Network management of tactical internetworks into the Army's TFXXI. Also by FY97 SNMP control of ATM (Ashore) and SNMP control of selected radio room equipment in Navy's JMCOMS program. By FY98 demonstrate standards based ATM and Internetwork protocol (IP) net management of global internetworks integrated into a JTF environment. Demonstrate a peer-to-peer interoperability between different network management systems including commercial and allied systems. By FY99 SNMP control of the Joint Tactical Switch System (JTSS) in Navy's JMCOMS program. Also by FY99, transition Integrated Management System prototypes developed for the DISN LES environment to a Tri-service global network management facility. By FY00 SNMP control of ATM and provide SNMP(V)2 or CMIP reports to CJTF/NAVFOR/MARFOR in Navy's JMCOMS program. This will enable the Warfighter to have a high degree of confidence that he will be provided with the necessary communications services required by all phases of the battle.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
SARD-TT, SAFRD-AQ, SNRD-XX (name/phone to be provided)	Virginia L. Castor DDR&E (703) 695-0005	TBD

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	10.5	15.0	17.7	16.7	17.8	16.5

IS2301AFNC Digital Warfighter Communications. Goal: Exploit emerging commercial communications technologies to provide commanders and warfighters with global seamless, non-hierarchical adaptive networks for multimedia communications in a highly dynamic battlefield. Supplement and in some cases replace, legacy military communications systems which are unable to keep pace with the rapidly increasing demand for communications bandwidth and global coverage in support of force projection and split-based operations. Evolve an integrated communication infrastructure which utilizes commercial protocols and standards to achieve global Tri-service interoperability through integration of land, air, space and sea networks into global ATM infrastructure.

Continue joint ATM experimentation in bandwidth on demand to support multimedia information requirements through DS-3 (LES) connection to other service labs from FY96-99. In FY96 demonstrate the integration of voice and data services in low rate tactical communications systems using HF and SATCOM. In FY97 insert ATM switching into the Army's MSE, develop a field demonstration version of the Air Force's SSCN and continue the Navy's shipboard MONET program to support joint task force multimedia requirements. In FY96 and 97 demonstrate Direct Broadcast Satellite technology in joint service exercises. To support OTM operations, demonstrate low profile antennas for both military (UHF, SHF) and commercial (C,Ku,X) SATCOM airborne and mobile ground tactical vehicles in FY96 and 97, and MILSTAR by FY98. By FY98, demonstrate GBS conformal antenna on aircraft and submarine platforms. By FY98 demonstrate a single panel optically controlled (photonic) phased array antenna, leading to a full sized optically controlled multibeam phased array antenna for satellite and terrestrial high data rate airborne and ground OTM communications by FY99. Demonstrate satellite and terrestrial PCS in FY97 and 98 to exploit both commercial CDMA and BCDMA technology for Army, AF, and Marine Corps applications. Demonstrate space crosslink technology via two maneuvering air platforms. To extend ATM services to forward tactical units, a Radio Access Point (RAP) will be tested in FY98. By FY97, begin joint experiments with a high capacity trunk radio (HCTR) to feed a variety of mobile subscriber services. By FY98, both manned and unmanned aerial platforms will be fitted with wideband relays to support OTM tactical (land and sea) operations at bandwidths of up to 155 Mbps. By FY00 demonstrate next generation mobile IP services connecting tactical internetworks for littoral and expeditionary warfare among Marine Corps, Navy, and Army combat net radio networks. This initiative overcomes technical barriers associated with incorporating emerging commercial standards into a battlefield environment, the design of protocols able to adapt to rapidly varying conditions, and the ability of disadvantaged links to support multimedia information services.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
SARD-TT, SAFRD-AQ, SNRD-XX	Virginia L. Castor DDR&E (703) 695-0005	JSC/J-6

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	42.4	53.1	56.4	47.8	23.6	24.6

Note: Space Comm funding rolled into these figures.

IS2401AFE Multiband, Multimode Information System. Goal: Provide the Warfighter with flexible, interoperable, communications system architecture building blocks by jointly developing the baseline architecture and modular technology needed for an objective Multiband Multimode Radio (MBMMR), meeting the joint service requirements for future digital radios.

In FY98-99 demonstrate a highly flexible radio architecture, allowing rapid waveform re-programmability/re-configurability to support the rapidly changing mission requirements of EW threat, interoperability, networking, traffic load, frequency assignment and general modes of operation. Provide the ability to enhance existing waveforms or emulate new waveforms simply by software or common module exchange. Technology insertion includes the use of advanced digital signal processors (DSPs), programmable four channel CYPRIS chip INFOSEC modules, and new interference cancellation (cosite) circuitry. It will use an open (industry releasable) system architecture, be highly software reprogrammable (waveform and INFOSEC), provide four simultaneous multiband multimode radio channels, provide networking functions and minimize the required number of antennas. Waveforms to be implemented include legacy waveforms such as SINCGARS SIP, UHF SATCOM Demand Assignment Multiple Access (DAMA), EPLRS VHSIC, Have Quick I & II (HQ I&II), Improved High Frequency Radio (IHFR), as well as high data rate packet waveforms required by the future digitized battlefield architectures, and commercial waveforms such as GPS and cellular radio. The Speakeasy core requirements specify multiband operation from 2 to 2000 Mhz. This initiative will eliminate the current lack of communications system interoperability and provide the Warfighter with the capability to communicate with anyone regardless of system limitations. Achieve significant reductions in logistics tail for supporting multiple radio systems for multiple applications. Technical barriers include the development of high speed digital signal processors, multiband antenna, and an industry/DOD joint radio architecture.

<u>Svc/Agency POC:</u>	<u>USD(A&T) POC:</u>	<u>Customer POC:</u>
F. Schrenk	Virginia L. Castor	MAJ A. Johnson
DARPA	DDR&E	ARSTAFF OPS
703-696-2371	(703) 695-0005	703-614-6741

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	19.1	15.0	8.6	9.9	5.4	2.5

IS2602E Advanced System Architecture Technology. Goal: Develop and demonstrate state-of-the-art applications specific software architecture technology that reduces weapon system life cycle costs by improving development productivity, product quality and extensibility through reuse and introduction of COTS/GOTS products, automated inclusion of "ilities," and automated migration of new hardware and system architectures. This DTO is focused on modifying and introducing to DoD weapons systems, highly successful commercial product-line approach to softare development and support.

By FY98, formalize the notion of system architecture and use this formalization to demonstrate the ability to statically evolve a system implementation by using the architectural specification to guide the replacement of selected components with components providing additional capability, and to support formal investigation of safety, security, and fault tolerance aspects of an architecture. The goal is to reduce the manpower and elapsed time to perform these activities over FY95 norms by 50% and 80%, respectively. By FY99, demonstrate the ability to use applications software architectural specifications to dynamically reconfigure an executing application in response to changes in its operating environment, reducing required manpower to perform same by at least 90%. By FY00, demonstrate the ability to use architecture specifications to encapsulate interface and protocol requirements by using architecture specifications to synthesize interfaces and communication mechanisms. When combined with the results of DTO's 27 and 30, this will pave the way for warfighter field programmable systems. By FY02, demonstrate the ability to perform architectural transformations, such as transforming an implementation to match a new target architecture, thus reducing software porting costs by 90-95% of today's experience. Results of this DTO will dovetail with other DTO's and joint technology initiatives in a timely manner to support the JCS Vision 2010.

Svc/Agency POC:
Samuel A. DiNitto, Jr
USAF-Rome Lab
315-330-2165

USD(A&T) POC:
Virginia L. Castor

Customer POC:
This technology is applicable to all software intensive systems. At the time of this writing/ demonstration, specific customers were source selection sensitive.

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	89.8	62.4	71.0	63.9	89.2	117.2

Note: All DARPA Funds

IS2702ANFE Knowledge-Based Design. Goal: Develop and demonstrate an intelligent system development environment that captures, represents, employs, and maintains domain, application, and engineering knowledge to achieve at least an order of magnitude productivity improvement over the current state-of-the-art development paradigms. AI, hypermedia, automated programming, formal methods, and object oriented technologies will be combined and integrated to define a knowledge-based environment—called the Knowledge-Based Software Assistant (KBSA)—in which all aspects of the system life cycle are formalized. The KBSA will provide automated assistance in the development and evolution of computer-based applications.

By FY97, demonstrate the utility of the new paradigm by using a KBSA prototype to develop and evolve an implementation of a software intensive military application, demonstrating at least a 5X productivity improvement. By FY98, complete the development of the advanced development model (ADM), increasing the KBSA's functionality. By FY99, integrate formal specification techniques into the KBSA, support user-oriented collaborative design and hardware/software co-design, and demonstrate an order of magnitude improvement in productivity.

Svc/Agency POC:
Samuel A. DiNitto, Jr.
USAF-Rome Lab
315-330-2165

USD(A&T) POC:
Virginia L. Castor

Customer POC:
There is no specific customer. This is a technology DTO that is applicable to multiple programs, systems and organizations.

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	24.6	48.4	36.6	42.9	39.3	39.1

IS2802FE Intelligent Information Technology. Goal: Develop and demonstrate advanced intelligent information gathering, fusion and filtering technology against C4I requirements in joint actions involving battlefield situation assessment, telemedicine, and intelligence fusion.

Planned improvements call for (by FY97) database agents for air campaign planning to locate high priority targets in minutes instead of hours. By FY98, 100%-125% improvements in location and access of required design data for large programs such as the F-22. By FY99, 50% improvements in data/knowledge through discovery/data mining techniques. Plan is to jointly work with the DARPA Intelligent Integration of Information (I3) Program. This improved capability for air campaign planning will assist the warfighter both in meeting his needs for information warfare, and in joint precision strikes, i.e., the Precision Force. By FY02, demonstrate near real time integration of discovery/data mining with sensor fusion and other ATR techniques. This DTO will support capabilities under the umbrella of dominanat battlespace knowledge and information warfare.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Samuel A. DiNitto, Jr. USAF Rome Lab 315-330-2165	Virginia L. Castor	This is a generic DTO with application to all engineering and support activities in DoD as well as to the warfighters.

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	62.3	52.6	50.1	49.5	59.8	63.2

IS2902NFE Software Technology For High Performance Computing. Goal: This DTO will develop and demonstrate mission critical software tools to develop and transition software to new applications of high performance computers to compute-bound problems in mission rehearsal, ATR, decision aids, and system engineering.

In FY99, demonstrate intelligent optimizing platform independent compiler with 5 to 10 times code improvement over 1995 baselines. In FY00, predict response-time performance throughout the design and coding phases for real-time and information processing HPC applications to within 98% of actual performance. In FY02, demonstrate high performance computer software engineering environments for reducing parallel software development costs by 75% over 1994 baselines. This capability will facilitate future intelligence, surveillance, reconnaissance warfighter missions predicted for the battlefield of the twenty first century.

<u>Svc/Agency POC:</u>
Samuel A. DiNitto, Jr.
USAF Rome Labs
315-330-2165

<u>USD(A&T) POC:</u>
Virginia L. Castor

<u>Customer POC:</u>
This is a generic DTO, applicable to multiple programs, systems, and organizations.

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	42.8	47.4	55.0	57.8	67.3	61.3

IS3002AFNE Advanced Embedded Software/System Engineering Technology. Goal: Develop, demonstrate and transition state-of-the-art computer-based software/-system engineering technology that addresses the $30 billion annual DoD expenditure on embedded software intensive systems by significantly improving development and re-engineering productivity and product quality for legacy and embedded systems through integrated COTS and other technologies.

By FY97, demonstrate the potential to reduce system engineering effort by 40% through the incorporation of object oriented technology. Demonstrate, by FY98, the potential to automatically incorporate extra-functional requirements, such as fault-tolerance and security, into mission critical software. Demonstrate, by FY00, the ability to efficiently perform field adaptable changes to incorporate new war fighting capabilities or interoperability requirements. Demonstrate, by FY02, the potential of knowledge-based technology to reduce total life cycle costs of software intensive embedded weapons software by 90% over the FY95 baseline. The products of this DTO will be combined with those of DTO 26 and 27 to provide the ultimate goal of warfighter programmable systems.

This DTO spans several of the designated warfighter needs/capabilities by keeping existing and future embedded systems operational and affordable. By addressing life cycle costs of software intensive weapon systems, this technology objective becomes essential to the ever decreasing defense budget, without risking the safety of the warfighter.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Samuel A. DiNitto, Jr. USAF Rome Labs 315-330-2165	Virginia L. Castor	This is a generic DTO with application to all acquisition and engineering activities as well as warfighters.

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	22.5	24.2	29.8	31.6	26.8	31.6

IS3102NE Intelligent Control. Goal: Demonstrate the use of artificial intelligence methods for creating and testing candidate control logic for autonomous and semi-autonomous devices. The focus is on methods which can utilize emerging simulations of devices and their environments (in order to minimize cost in quickly yielding reliable software for control), and methods which are extendible to acquisition of control logic in support of single devices as well as multiple-device systems where coordinated behavior is required. Demonstrations of control logic acquisition and testing are conducted with simulated applications of undersea, ground, and air vehicles engaged in tactical combat and strategic maneuvering (including applications to terminal guidance of weapons and use of multiple UAVs). Real-time control is supported by data from innovative vision subsystems.

In FY97, demonstrate learning of control on area mapping tasks, learning of tactics for coordinated behavior by multiple mobile robots on a surveillance task, and implementation in environments in which other agents are also learning; in FY98-02, demonstrate learning of tactics for coordinated behavior by multiple mobile robots on complex surveillance tasks, and distribute to service laboratories advanced tools integrating machine learning. This DTO contributes to Joint Warfighting Dominant Battlespace Knowledge by providing tools to create software for control of mobile surveillance and reconnaissance platforms, and to Precision Force by providing tools for the adaptive testing of guidance and control software in weapon delivery systems.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Samuel A. DiNitto, Jr. USAF Rome Lab 315-330-2165	Virginia L. Castor	UAV/UGV's and any other systems requiring autonomous control (i.e., space-based, hazardous environment robots, etc).

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	25.1	22.8	34.0	15.0	22.1	22.9

IS3202NFE Information Presentation and Interaction. Goal: Develop and demonstrate advanced concepts which allow a warfighter to interact with a global information system in a manner which is naturally expressive, adaptable to changing roles, timely and flexible. Spectrum of activities include infrastructure support for collaborative decision making, for both localized and physically dispersed groups; synthetic visualization for mission rehearsal, simulation and training; enhanced situation awareness using presentation technology for 3-D viewing; and more natural modes of input such as speech and gestures.

By FY97 demonstrate a group datawall with spoken input and direct pointing interface. Demonstrate virtual environment for mission rehearsal. By FY98 demonstrate a large vocabulary, speaker independent, natural language input. By FY00 incorporate gesture interpretation with spoken input as synergistic interface.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Samuel A. DiNitto, Jr. USAF Rome Labs 315-330-2165	Virginia L. Castor	All C4I upgrades requiring collaborative decision making/ mission rehearsal, dealing with presentation of enormous amounts of data.

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	70.7	84.2	123.2	94.1	130.3	149.9

IS3302NE Embedded High Performance Computing. Goal: Provide timely, affordable, and easily upgradable technology to meet the high speed computational demands of the military by leveraging and influencing the efforts of the commercial sector. This DTO will provide the technology for improving ATR from air, space, ground, and sea vehicles and weapons, as well as improving other high computation tasks such as sensor/data/knowledge fusion for situation awareness.

By FY97, demonstrate capability for 100 giga-flops per cubic foot for militarized high performance computing. By FY00 demonstrate a tera-flop scalable system with a hard-realtime secure operating system and middleware. By 2000 also demonstrate a high performance architecture independent software/system engineering suite for achieving a minimum of 50% overall efficiency on massively parallel computers.

Svc/Agency POC:
Samuel A. DiNitto, Jr.
USAF Rome Lab
315-330-2165

USD(A&T) POC:
Virginia L. Castor

Customer:
This is a generic DTO, applicable to all military applications requiring rapid processing of large amounts of data and/or complex calculations.

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	63.1	73.1	62.7	66.1	72.2	72.5

D. DEFENSE TECHNOLOGY OBJECTIVES FOR GROUND VEHICLES AND WATERCRAFT

GV.01.06.A	Advanced Ground Vehicle Systems
GV.02.08.ANE	Ground Vehicle Integrated Survivability
GV.03.00.ANE	Advanced Ground Vehicle Mobility Systems
GV.04.00.A	Ground Vehicle Electronic Systems
GV.05.00.AN	Ground Vehicle Chassis and Turret Technologies
GV.06.02.N	Surface Ship Power and Auxiliary Systems
GV.07.02.N	Surface Ship Hull Systems
GV.08.02.N	Surface Ship Integrated Topside Systems
GV.09.01.NE	Surface Ship Automation
GV.10.02.NE	Submarine Advanced Machinery Truss Support System
GV.11.02.N	Submarine Maneuvering Systems
GV.12.01.N	Submarine Signature Control Systems
GV.13.02.N	Submarine Structure Systems
GV.14.07.N	UUV Technology

GV.01.06.A Advanced Ground Vehicle Systems. Demonstrate, through virtual prototyping and user field experimentation, technologies for a leap-ahead Future Main Battle Tank (FMBT) having 50 - 100% greater capability, and the feasibility and operational potential of a Scout Vehicle (SV) with a lightweight vehicle chassis integrating DoD-Wide scout-specific technologies. Integrated Concept Teams (ICTs) led by US Army Armor Center with Army Materiel Command (AMC) and Program Executive Office - Armored Systems Modernization (PEO-ASM) participation are currently developing vehicle requirements, technology assessments, and program plans. The virtual prototype of the FMBT will reduce vehicle length by 3 feet and weight by 50%; increase the effective range of the weapon system by 40% while reducing the target servicing timelines; possess the ability to acquire and identify threats at longer ranges; have reduced crew size accomplished through advanced crew stations reducing crew workload by 50%; provide reduced susceptibility to attack, and reduced vulnerability. The SV will employ virtual prototyping and integrated product teams to reduce timelines and optimize performance capabilities. Deployability and supportability benefits will be realized through the capability advances as well as size and weight reductions. By FY98, formulate strategy, identify Force XXI warfighting roles for both vehicles. Concurrently, optimize the FMBT configuration and demonstrate the User optimized SV design in the virtual environment. In FY99, through Synthetic Theater of War and Virtual Prototyping (VP), the effectiveness of the optimal FMBT and SV designs will be modeled and simulated and the virtual concept of the ATD will be complete. In FY00, complete FMBT and SV designs as feeder component ATDs are transitioned and technologies integrated. The feeder ATDs include: Hit Avoidance, Combined Arms Command & Control, Target Acquisition, Hunter Sensor Suite and Crewman's Associate. Also in FY00, document a savings of 30% in time and cost in the vehicle Demonstration/Validation program phase for both the FSV and FMBT from implementation of Integrated Product and Process Development and VP. Demonstrate the combined/synergistic effects of integrated multiple technologies on a surrogate combat vehicle platform and the increased survivability, lethality and mobility of the FSV in FY01 through User Warfighting Experiments and validate FSV tactics and performance goals.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.5	2.4	1.3	20.9	34.7	37.4

GV.02.08.ANE Ground Vehicle Integrated Survivability. Demonstrate an integrated suite (armor, signature, hit avoidance. . .) of survivability technologies for combat vehicles employed in future mounted force operations. These technologies will provide a greater than 20% increase in ground vehicle survivability, resulting in a force effectiveness increase of 40% through an integrated survivability design approach. Future ground vehicle designs will feature integral detection, hit and kill avoidance technologies while lightweight structures employing advanced materials will provide rigidity and penetration avoidance. The affordability goal is to achieve a 20% increase in survivability with a cost not to exceed 15% of the production baseline vehicle. Complete design of the Hit Avoidance Architecture and demonstrate suppressed engine signature components and armor for medium vehicle bullet and missile threats in FY96. In FY97, complete design of reduced signatures for vehicle hull components and demonstrate hit to kill near-term active protection against smart threats, reduction of smart threat munitions hit probability from 0.8-0.9 down to 0.2, and roof armors to defeat Explosively Formed Penetrators (EFP), bomblet and tactical air threats. In FY98, demonstrate a 50% reduction of hull components signatures and in FY99, enhanced signature suppression on fielded vehicles, survivability modeling capability to reduce test cost by 25%, and weight reduction of heavy vehicle frontal armor by 35%. By FY00, demonstrate a 75% signature reduction of baseline hull and optimized survivability solutions for combat vehicles.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	10.6	11.0	7.0	8.2	3.4	3.0

GV.03.00.ANE Advanced Ground Vehicle Mobility Systems. In FY97, demonstrate selected advanced mobility components and technologies to include: advanced motor and generator configurations for electric drive, advanced high power controller packaging, and adaptive suspension damping (tracked vehicle). In FY98, demonstrate active track retention system, continuous band type track for a 30 ton vehicle and advanced traction control. In FY99, demonstrate full active suspension and running gear advances which employ sensors, fuzzy logic, neural networks, and advanced lightweight materials. By FY00, diesel engine projects will have demonstrated advances in fuel injection, air management and thermal management to reduce size, weight, heat rejection and signature. Compared to the Abrams/Bradley baseline, reliability and availability will improve due to increased use of electronics, smaller size and weight, and increased use of modular components. Resulting improvements include: deployability by 50 percent, survivability by 50 percent, vehicle hull weight and volume reduction by 25 percent, increased vehicle range by 30 percent, increased design flexibility, increased vehicle burst power by 100 percent when integrated with energy storage, and improved diagnostics and prognostics by 100 percent. By the year 2000, demonstrate tactical operations employing highly agile, robust semi-autonomous ground vehicles. By FY97 navigate to a designated position in urban terrain employing limited obstacle avoidance. By FY98 demonstrate a full performance urban terrain scout with autonomous anti-sniper mission, and by FY99 an air-drop of a deep insertion Reconnaissance Surveillance Target Acquisition vehicle with a 1+ kilometer radius of maneuver. By FY00 perform a precision strike air insertion of a robotic ground vehicle with self-protection and capability for emplacement and recovery of Internetted Unattended Ground Sensors. Demonstrate in FY01 an electrically driven Ground Propulsion Mobility TD providing a 30 percent improvement in firing/surveillance platform stability, all conceptualized power demands of an EM Gun, and all other electric vehicle requirements.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	31.1	32.5	33.6	26.0	16.5	18.2

GV.04.00.A Ground Vehicle Electronic Systems. Demonstrate a VETRONICS Open Systems Architecture (electronics integration), a user friendly crew station (crew integration), and advanced digital information handling systems (Battlefield Information Integration) necessary to enable the crew/vehicle to fight and win the information war. The development of the VETRONICS Open Systems Architecture is based on commercial standards and software reusability/transportability which reduces overall system code development time by approximately 50% and decreases integration time of vehicle subsystem hardware and software by approximately 30%. Demonstrate via virtual simulation, a crew station for ground combat vehicles utilizing advanced soldier-machine interfaces (SMI), which increases crew performance by 50% and complete Crewman's Associate ATD in FY96. In FY98 link the Vetronics Systems Integration Laboratory (VSIL) and Communications and Electronics Command's (CECOM) Digital Integrated Lab (DIL) for C3I. In FY98, integrate the Crewman's Associate ATD into the VSIL. In FY99 demonstrate the advanced crew station using vehicle-ready hardware and software, in a full vehicle system integration lab (SIL) and conduct soldier experiments over the DSI. In FY00, transition an intra-vehicular open systems electronics architecture, based on commercial standards and compliant with the Weapons System Domain Common Operating Environment portion of the Army Technical Architecture, to engineering development and the FMBT effort.

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Funding ($M)

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	5.0	8.8	8.3	7.4	8.6	9.5

GV.05.00.AN Ground Vehicle Chassis and Turret Technologies. Demonstrate a 30 percent reduction in vehicle structural and armor weight through the use of lightweight materials such as composites for structural and armor applications in ground combat vehicles as an integrated system with signature technologies incorporated. Complete fabrication and assembly of Composite Armored Vehicle ATD in FY97. By FY98 demonstrate the feasibility of a composite structure and advanced armor solution for a 22 ton air transportable vehicle weighing at least 33 percent less than an aluminum based structure and armor of equal protection level. Concurrently, demonstrate manufacturability, repairability, durability and large section cutouts/joining of composites as well as integration of signature management. Assess affordability of composite structures for ground combat vehicle applications. By FY02 transition to development of future systems. By FY05 transition to development of the next generation of tactical wheeled vehicles.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	13.5	14.9	2.6	0.8	0.7	0.6

GV.06.02.N Surface Ship Power and Auxiliary Systems. Develop the technical basis leading to affordable options for more survivable and efficient ship power and auxiliary systems. By FY00: (a) Develop a more affordable standardized family of software controlled, power circuit breaker concepts having 50% reduced weight and cost; (b) Develop solid-state power electronic building blocks for shipboard electrical equipment having 50% reduced weight and cost; (c) Demonstrate zero emission, diesel-fed fuel cell module having 300% increase in power density and 30% increase in efficiency for ship service power application. By FY05: (a) Demonstrate intelligent, reconfigurable solid-state based zonal electric distribution system for uninterruptible ship power; (b) Develop lightweight, low volume auxiliary system concepts complementing the solid-state based zonal electrical distribution system.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	5.3	4.4	4.0	3.6	3.6	3.6

GV.07.02.N Surface Ship Hull Systems. Develop the technical basis leading to affordable options for more reliable, efficient, and combat tolerant hull systems. By FY00: (a) Develop and verify reliability criteria which account for all primary ship failure modes (i.e. fatigue, fracture, and stability); (b) Reduce construction costs by 20% by developing more affordable structural concepts such as advanced double hull structures, commonality of components, and improved structural arrangements for distributed systems; (c) Reduce the vulnerability of ships by 40% through hull design concepts based on fundamental understanding of loading and response of structure to underwater explosions; (d) Develop active control systems to limit underwater signatures to 1/4 of present levels; (e) Develop hull forms resulting in 10% reduction in drag resistance; (f) Develop a propeller concept having a 20% improvement in propulsive efficiency. By FY05: (a) Develop reliability based concepts to reduce hull maintenance costs by 20%; (b) Reduce the vulnerability of ships by 50% through concepts that will reduce the probability of mass detonation of a magazines; (c) Develop hull and propulsor concepts to reduce ship turning diameter at low speed by 30%; (d) Improve motion limited combat system effectiveness by one full sea-state through the development of fully integrated, intelligent control systems. By FY10: (a) Develop real-time, ship virtual environment for development and operational testing of unconventional post-SC21 ship candidates. (b) Demonstrate feasibility of adaptive structure capability to automatically monitor and adjust to environmental and combat degradation in order to maintain mission capability.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	9.7	10.3	11.1	5.4	5.4	5.4

GV.08.02.N Surface Ship Integrated Topside Systems. Develop and demonstrate the technical basis leading to affordable light-weight topside systems having reduced signatures, controlled EM emissions, and improved sensor performance. By FY00: (a) Reduce topside weight fraction by 40% through the development of integrated multi-function antennas and composite structures; (b) Develop ship topside options that combine shaping, arrangements, antenna concepts and other control techniques to obtain balanced RCS/IR signatures including hull hardbody and wake; (c) Demonstrate, at-sea, wideband (2 MHz to 50 GHz) electromagnetic emission monitoring system; (d) Demonstrate the capability to affordably integrate sensors, electromagnetics, signature reduction, advanced materials, structures, and manufacturing technology into a full-scale mast and conduct at-sea evaluations; (e) Demonstrate, at-sea, a low signature, multi-functional communication system fully integrated into a composite structure; (f) Demonstrate a low RCS/IR signature stack concept with fully integrated SATCOM capability. By FY05: (a) Develop a low signature, structurally integrated, multi-functional EM system for target search and track. By FY10: (a) Demonstrate a real-time, active EMI and signature control concept capable of modifying communications and combat system frequencies as well as RCS/IR signatures in response to combat environment.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	10.2	17.9	19.6	17.1	7.6	2.6

GV.09.01.NE Surface Ship Automation. Develop the technical basis leading to affordable automation options for drastically reducing manning and improving fight-through capability. By FY00: (a) Develop an advanced damage control system (i.e., sensors, fire fighting agents, decision algorithms) to decrease the time to locate, classify and extinguish fires by 25%; (b) Develop an intelligent machinery monitoring and control system to decrease machinery watchstanding requirements by 25%. By FY05: (a) Demonstrate a smart control system for a solid-state zonal power distribution system having 40% reduced weight, 50% reduced manning, and 50% reduced acquisition cost; (b) Develop automated fast response concepts to decrease restoration time from fire, smoke and flooding casualties by 50%; (c) Develop virtual environment for development and demonstration of automation scenarios, functions, and technology (e.g., damage control).

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	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	13.1	17.9	9.4	9.5	9.5	9.5

GV.10.02.NE Submarine Advanced Machinery Truss Support System. Develop and demonstrate an equipment support system that provides integrated acoustic quieting and shock isolation performance to support modular construction and reduced equipment cost (<10%) through utilization of commercial off-the-shelf equipment. By FY97, develop a semi-active shock mount and establish a process for evaluating performance of integrated shock and acoustic mounts. By FY99, transition DARPA Project M technology and demonstrate 10 - 20 dB reduction in low frequency modes at ISMS. In FY00, demonstrate at 1/4-scale heavy weight truss concept for target strength and radiated noise reduction (10 dB) and to support heavy-weight noise sources. In FY03, demonstrate at 1/4-scale integrated active and passive mount/structural concepts to attenuate shock loads and acoustic signatures.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	5.2	2.9	3.3	3.6	4.1	7.2

GV.11.02.N Submarine Maneuvering Systems. The objectives are to: develop and demonstrate a full stern/integrated propulsor providing improved low-speed maneuverability, quiet station keeping, increased weight margin and reduced submarine length (5%); and develop physics-based simulation methods and concepts to support improved submarine maneuverability for shallow water operations and expanded submerged operating envelope. In FY96, evaluate first generation small-scale full stern/integrated propulsor concept for powering and stability performance. In FY97/FY98, evaluate second generation model for maneuvering and acoustic performance. By FY00, demonstrate electrically powered actuator technology for jam resistant steering and diving systems. By FY01, demonstrate quiet electric drive motors/thrusters for secondary propulsion systems (NSSN noise goals). By FY01, demonstrate improved maneuvering simulation capability and evaluate at small-scale concepts for improved maneuvering characteristics and by FY05, demonstrate at large-scale improved low-speed maneuvering characteristics (50% reduction in turning radius) over conventional propulsors. By FY05: large-scale demonstration of maneuvering system concept for improved shallow water performance; demonstrate fully automated fail-safe maneuvering system concept; demonstrate at large-scale acoustic quieting performance in full stern/integrated propulsor at least equivalent to NSSN goals.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	5.8	5.7	11.0	15.4	12.5	10.0

GV.12.01.N Submarine Signature Control Systems. The overall objective is to control acoustic and non-acoustic signatures to insure a stealth advantage for U.S. submarine forces. By FY00, demonstrate active and passive acoustic signature control concepts that have reduced weight, volume, and cost (10% reduction) impact compared to current silencing technology and are compatible with shock reduction technology. By FY00, demonstrate concepts to control electromagnetic signatures to reduce mine vulnerability and detection. By FY02, develop hydroacoustic simulation capability to enable reductions in hull flow and propulsor noise (3 to 10 dB) and to support reduced design cycle time and testing. By FY02, demonstrate at large-scale quiet reduced complexity propulsor (NSSN noise goals). By FY03, develop coating technology and structural concepts for reduced radiated noise and target strength signatures. By FY05, demonstrate multi-spectral materials for non-acoustic signature reduction.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	24.4	20.8	5.4	5.1	8.3	8.4

GV.13.02.N Submarine Structural Systems. Objectives are to develop structural system concepts which: are compatible with shock and acoustic reduction technologies; provide intrinsic shock and acoustic energy dissipation; and support modular construction and incorporation of COTS equipment for cost reduction. By FY00, develop shock isolation system concepts to reduce equipment accelerations by 70%. By FY00, develop 1/4-scale land-based shock evaluation capability. By FY05, develop and demonstrate at 1/4-scale capability to design pressure hull and non-pressure hull structures for balanced static and shock strength and which can provide 5 dB reduction in acoustic signatures over current hull technology.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.4	2.1	2.4	2.5	2.9	3.0

GV.14.07.N UUV Technology. Demonstrate by 1997, a 2X improvement in low rate energy density and a 50% reduction in life cycle costs with the development of a rechargeable lithium battery to replace zinc/silver oxide in UUVs and targets; a 2X improvement in trajectory control (above 4 knots) by the development of new technology in nonlinear controllers and propulsors; a 2X improvement in mission robustness; a 10X improvement in undersea communications data rate in the shallow water (multipath) acoustic channel; and a 10X improvement in navigational accuracy. By 1998, demonstrate a UUV wick/Rankine thermal system with 5X the energy density of zinc/silver oxide battery; and a torpedo high rate wakeless, environmentally benign, alternative to fuel thermal power system, 2X Otto fuel power density. By 2000, demonstrate a low rate energy density rechargeable battery with a 4X improvement in energy density of zinc/silver oxide; a 10X improvement in low speed trajectory control (hover< 4 knots) with a 50% reduction in development and maintenance costs, by development of a nonlinear adaptive controller and a thrust vectored pumpjet propulsor; a 4X improvement in mission robustness for a 40 hour sortie using artificial intelligence; a 20X improvement in undersea acoustic data rate; a 10X improvement in navigational accuracy with covert (passive) terrain matching/mapping, with a 50% reduction in system cost; and a 3 dB reduction in acoustic and a 4X reduction in Electro-Magnetic signatures. By 2005, develop and demonstrate, a low rate UUV thermal wick/Stirling energy system with 7X the energy density of a zinc/silver oxide battery; and a high rate HYDROX torpedo energy system with 4X Otto Fuel Power/Energy Density; a 100X improvement in hover control with nonlinear intelligent/adaptive controllers; a 10X improvement in robustness with autonomous mission controllers for a 40 hour mission; a 30X increase in data rate and a 2X increase in range; a miniaturized covert precision navigation system with 100X improvement in navigational accuracy; and a 6 dB reduction in low frequency acoustic signature and a 10X reduction in Electro-Magnetic signature.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	11.5	11.5	11.9	12.4	12.7	13.2

E. DEFENSE TECHNOLOGY OBJECTIVES FOR MATERIALS/PROCESSES

MP.01.05.AN	Protective Materials for the Combatant and Combat Systems Against Conventional Weapons
MP.02.05.NF	Laser Protective Materials for Warfighters and Equipment
MP.03.06.NFE	Materials and Processes to Prolong the Active Life of Aging Systems
MP.04.06.NFE	Materials and Processes for Major Cost Reductions
MP.05.01.NFE	Sensor and Device Materials to Achieve Significant Increases in Information Gathering, Analysis, and Dissemination to Improve Battlefield Situation Awareness
MP.06.02.ANF	Armament and Ordnance Materials to Reduce Shot Per Kill Ratios
MP.07.06.NF	Materials and Processes for Higher Performance, Affordable Propulsion
MP.08.06.E	Affordable Multi.Missile Manufacturing (AM3) ATD
MP.09.06.E	Producible Designs for Affordability
MP.10.06.E	Interferometric Fiber Optic Gyro (IFOG) Flexible Manufacturing
MP.11.11.A	Mobility, Countermobility, and General Engineering
MP.12.11.N	Logistics Support for Expeditionary Forces and Naval Combatants
MP.13.11.FD	Wartime Contingencies and Bare Air Base Operations
MP.14.06.AF	Structures and Fortifications for Force Protection Against Conventional Arms
MP.15.06.FN	Fire Fighting Capabilities for the Protection of Weapon Systems
MP.16.11.AFN	Airfields and Pavements to Support Force Projection
MP.17.06.ANFED	Hazardous and Toxic Waste Treatment/Destruction for DoD Operations
MP.18.06.AFD	Cleanup of Contaminants
MP.19.06.NFD	Metal Cleaning Processes and Coating Materials
MP.20.06.AD	Sustainable Land and Airspace Use for Training and Testing
MP.21.06.ANFS	Affordable Industrial Processes and Practices
MP.22.06.ANFS	Capable Manufacturing Processes
MP.23.06.ANFES	Affordable Short.Lead.Time Repair and Low volume Production

MP.01.05.AN Protective Materials For The Combatant And Combat Systems Against Conventional Weapons. With the end of the Cold War the mission of ground forces has shifted, and increased emphasis is being placed on smaller confrontations and peacekeeping efforts. These efforts must be conducted with a minimum of casualties. Improved armor materials are required to provide the individual combatant and ground combat systems with increased protection against conventional weapons such as small arms and artillery fragments.

- Provide materials which will result in a 40 percent weight reduction to protect individual combatant against small arms projectiles and fragments by 2001.
- Develop transparent armor materials to provide face shield, window, and windshielding protection against small arms and fragments at 30 percent weight reduction by 2001.
- Develop armor materials to protect combat systems against conventional weapons at 30 percent weight reduction by 2001.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	1.4	1.5	1.4	1.6	0.8	0.8

MP.02.05.NF Laser Protective Materials For Warfighters And Equipment. The evolution of lasers as weapons will require the development of new materials for protection. Laser protection for these systems must address personnel, electro-optical (EO) sensors, communication systems, windows and canopies, structural components, and thermal control systems. Low energy, commercially available lasers may be employed by hostile forces as EO countermeasures. These lasers are proliferating and present a significant risk to DOD personnel and EO systems; man-portable targeting systems, ground vehicle targeting and navigational systems, guidance systems of precision guided munitions; and airborne EO sensors. The major directed energy warfare problem facing DOD is protecting its 600,000 ground troops and thousands of ground vehicle and air crews from frequency agile lasers, or lasers of unknown wavelength. Protection for the case of known, fixed wavelength lasers is in production. The challenge is to provide the best laser protection with the least degradation of other performance parameters.

- Provide materials for laser protection of individual combatants, electro-optical sensors, communication systems, windows and canopies, structural components and thermal control systems. Extend system damage threshold against short pulse lasers by a factor of 1000 while maintaining optical transmission greater than 90 percent for IR/EO sensors by 1998. Also, provide jamming protection to levels of 10^6 attenuation or more.
- Provide tristimulus (3 narrow transmission bands vs rejection notches) filters compatible with cockpit displays having a user rating of display compatibility greater than 90 percent by 1997 for daytime use only.
- Demonstrate day/night usable protective devices compatible with cockpit displays and life support systems by 1999. The critical challenge is providing full retinal protection while maximizing out-of-band transmittance to ensure visibility of cockpit displays while minimizing haze and spurious reflections and ensuring environmental stability. Demonstrate full rate production of visors/spectables by 2001.
- Reduce reflective signatures of DoD optical devices.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	16.7	15.5	15.6	16.1	16.6	17.2

MP.03.06.NFE Materials And Processes To Prolong The Active Life Of Aging Systems. Transition from periodic or time-based maintenance to condition-based maintenance with accompanying 80 percent reduction in mechanical flight malfunctions/failures by 2010. Insure that weapons systems are maintained at the highest state of readiness at minimum cost. Example of payoff for life extension include a 50 percent reduction in aircraft maintenance hours, a 35 percent reduction in spare parts inventories and a 50 percent reduction in the fabrication of complex machinery components. Subgoals include technology for:

- Detection of hidden corrosion in aircraft with 25 percent operation and support cost savings (corrosion) by 2005.
- Fifty percent reduction in corrosion initiated flaws, resulting in life-cycle component cost savings of 40 percent by 2003.
- NDE methods for using knowledge based systems for flaw assessment by 2000.
- Wear monitoring sensors for life management with 30 percent reduction in ship maintenance hours by 2005.
- Long-life (10 year) ship antifouling coating for reduced drag (fuel savings) and 35 percent maintenance cost savings by 2005.
- Sixty percent life increase for helicopter replacement parts via increased corrosion and fatigue resistance by 2005.
- Provide longer life electrochemical power sources for man-portable military electronic equipment by 2005. Develop methods for fully automated processing of rechargeable batteries that provide <u>three times</u> the energy per weight and energy per volume of current systems. Develop simplified fuel cell technology that will enable the use of military (logistics) fuels for portable electrical power requirements with a two-fold improvement in efficiency.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	20.8	19.4	21.2	22.9	24.3	26.2

MP.04.06.NFE Materials And Processes For Major Cost Reductions. Develop materials and processes for weapons systems and platforms that break from tradition to permit unprecedented reductions in acquisition or in-services cost without sacrificing performance or safety. Special emphasis is placed on adapting commercial processes to military hardware. Specific goals and milestones include:

- Develop by 2000 processes for the production of ultra-low cost titanium ($7/lb) through consolidation of powders for a 50 percent cost reduction. Primary applications are lightweight ground vehicle armor and ship piping systems.
- Develop by 2000 fabrication and processes for thermoset composites using fiber and tow placement to effect a 30 percent cost savings in F/A-18E/F and F-22 wing control surface and similar components.
- Develop by 2000 intelligent, flexible hot isostatic processing of metal powders and castings for primary structures with a 60 percent cost savings in small lot (10-100) unit cost.
- Develop by 2005 biotechnology approaches to material cleaning, waste-water filtration, and anti-fouling to produce 40 percent operational savings and achieve environmental compliance for Navy ships and submarines.
- Develop by 2010 solid-free-form processes to produce secondary structural components directly from metal and ceramic powders and digital design information. Through the elimination of inventory costs and providing on-demand logistical supply a 90 percent unit cost reduction in complex components, such as pump impellers, is expected.
- Develop by 2010 biotechnology approaches to material feedstock for elastomers, coatings, and lubricants permitting a 60% cost reduction in materials and 40% cost reduction in recycling costs for ground vehicles, ships and submarine applications.
- Develop by 2010 fully automated welding systems with built-in nondestructive diagnostics for a 60 percent labor cost reduction in welded structures.

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	FY96	FY97	FY98	FY99	FY00	FY01
Total	58.8	69.7	83.1	93.3	99.6	103.4

MP.05.01.NFE Sensor And Device Materials To Achieve Significant Increases In Information Gathering, Analysis, And Dissemination To Improve Battlefield Situation Awareness. By 2003 develop advanced materials and processes that lead to EM sensors having 50 percent increase in infrared (IR) sensing range and a two-fold improvement in target identification including identification of friendly forces. Develop solid state phase shifter materials enabling 70-90 percent weight and size reduction. Improve SiC materials to provide 10 times the device power at the same size or smaller with a 400-500°F increase in operating temperature. Develop magnetic random access memory which is non-volatile and radiation hard with densities comparable to DRAM (500 Mbits/em^2) and speed of SRAM (access time < 3 usec) for satellite and strategic missile applications. Devise low-cost fabrication methods for low-density, large area piezoelectric acoustic sensors for seaborne mounted arrays. Develop superconducting filters and resonators with 10 times performance improvement per unit size. Develop non-linear optical materials that will revolutionize the ability to gather, analyze, and disseminate information with devices that operate at the speed of light, i.e., enable the revolution from electronics to photonics. The above listed examples of materials improvement will speed the acquisition, analysis, and dissemination of information which will provide the battlefield commander with real-time information about the status of hostile and friendly forces, assets, and movements.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	12.7	13.7	12.9	14.2	15.4	16.2

MP.06.02.ANF Armament And Ordnance Materials To Reduce Shot Per Kill Ratios. Small Confrontations, and peacekeeping efforts will feature an increase in mobility of the individual combatant and ground combat systems, an increase in the effectiveness of counter-battery fire, and a long logistics train. This new scenario demands increased lethality of the conventional weapons used by and supporting the individual combatant and their ground combat systems. While depleted uranium (DU) is currently the most effective material for long-rod anti-armor penetrators, recent experience in the "Gulf War" has demonstrated the need for an equally effective alternative without the costly health, environmental and disposed issues associated with manufacturing and battlefield cleanup of D.U. In addition the "Gulf War" provided dramatic demonstrations of the pin-point accuracy and localized destructive power achievable with precision guided munitions but it also provided vivid examples of the erosion damage caused by combat operations in sand and dust which can quickly reduce the transmission of the IR domes and windows thus blinding the sensors.

– Provide environmentally benign penetrator materials with 10 percent greater armor penetration than current materials by 2003.
– Develop lighter, stiffer sabot materials to increase launch velocity by 10 percent by 1998.
– Develop durable coatings and substrate materials for IR domes and windows capable of surviving rain and sand at captive carry velocities of Mach 1 by 2000.
– Develop multi-mode transparent missile guidance domes capable of surviving currently specified rain/dustfields with a 25 percent increase in velocity by 2006.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	4.2	4.5	1.7	1.8	1.8	1.0

MP.07.06.NF Materials And Processes For Higher Performance, Affordable Propulsion. Develop and transition enabling materials and processes to improve all defense propulsion systems including diesel engines (higher operating temperatures; better fuel economy) rocket motors (upgraded turbopumps; better system reliability), and turbine engines (higher rotational speeds; increased thrust-to-weight). The major current emphasis is the Integrated High Performance Turbine Engine Technology (IHPTET) initiative to double the performance and reduce the cost of turbine engines. Dramatic advances in materials and processes are critical to achieving the IHPTET goals; for example, metal-matrix composite rings will reinforce compressor disks at temperatures up to 1400°F by 1997 enabling the higher temperature cycles and higher rotational speeds needed for increased thrust or power-to-weight ratios. Many other materials are being developed to meet the requirements of the turbine engine as a system; a key component often overlooked is the new, high temperature lubricant which by 1998 will enable the engines to run at higher temperature with 10 percent lower specific fuel consumption and extended times between overhauls. The IHPTET program and the related materials developments will carryon past the year 2000 with benefits to air platforms (e.g., Unmanned Air Vehicles) and weapons; projections of an 115 percent increase in radius for an upgraded F-18 and a 35 percent reduction in gross weight and acquisition cost for a new fighter (e.g., technology being demonstrated for Joint Advanced Strike Technology (JAST)).

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	25.2	27.2	35.5	34.3	30.7	31.9

MP.08.06.E Affordable Multi-Missile Manufacturing (Am3) ATD. In FY96-97, develop advanced missile design and manufacturing enterprise concepts and systems to reduce the cost of tactical missiles by 25-50%. Address key technical barriers in information system integration and flexible assembly/test systems for multi-product production. By FY97, document the estimated savings across the entire DOD tactical missile portfolio, and define a series of component and system level demos that resolve risks in moving to flexible multi-product production capabilities that use the mix of missiles to regain economies of scale lost by declines in missile production volumes. By FY98 demonstrate multi-missile component designs, integrated information systems for missile enterprises (including supplier chains), and manufacturing facilities that can meet Tri-Service needs with a single set of technical and business processes. By FY00, implement at least two cost-shared pilot multi-missile enterprises; demonstrate new production methods and flight qualify new hardware for at least two missile systems; demonstrate, at the missile level, the feasibility of reducing the unit cost of ongoing missile production programs by 25%; reduce development and production cost for new missile and major upgrades by 50%; reduce the dependence of unit cost on lot size; and, reduce development cycle times by 50%. By FY2005, implement across entire missile portfolio.

Demo by: FY98 (components), FY00 (missiles). Benefits: ability to afford up to twice as many missiles within a fixed budget; faster development cycles to keep up to date technology in the field; and, a residual base of new competitive capabilities that can respond rapidly to warfighter needs.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	17.2	14.2	25.0	25.0	20.0	0

MP.09.06.E Producible Designs For Affordability. In FY96, continue integration of network-based engineering tools and knowledge bases to enable geographically distributed Integrated Product Teams to interact with one another and with the evolving design. In FY97, demonstrate transition of an Infrared Design Advisor to the IRFPA flexible manufacturing program; and integrate detailed parametric cost models, producibility analyses and assembly simulations to address cost as an independent variable for missile seekers and other complex assemblies. By FY98, develop solutions for integrating heterogeneous distributed data bases and CAD/CAE applications that will work at the scale of an entire major weapon system product/process information repository. In FY99, transition a distributed design environment for IPPD in missiles and similarly complex electro-mechanical systems, with the ability to address cost as an independent variable early in conceptual design and achieve highly producible designs in less time. By 2000, demonstrate the ability to explore 10X more alternatives in conceptual design in one half the time, achieve a 30% reduction in design-to-production transition time for electro-mechanical assemblies, and demonstrate accurate cost estimating tools for conceptual design. By 2005, demonstrate an 80% reduction in design change costs for a complex system.

Demo: FY98-01. Benefit: Provides integrated, computer-based engineering tools to enable geographically distributed Integrated Product Teams to meet DOD requirements for IPPD. Gives DOD the benefits of combining specialized weapon system design and analysis tools with general purpose commercial design tools, using widely available Internet infrastructure capabilities.

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	FY96	FY97	FY98	FY99	FY00	FY01
Total	13.7	18.6	21.7	20.7	18.2	21.2

MP.10.06.E Interferometric Fiber Optic Gyro (Ifog) Flexible Manufacturing. In FY1996, continue component development and process improvement for tactical grade (1 deg/hr drift rate) IFOGs based on the late FY1995 intermediate build of 30 single axis IFOGs using new component vendors and improved processes; baseline components and processes for precision navigational grade (0.01 deg/hr drift rate) gyros; and, initiate flexible manufacturing line design. By FY1997, demonstrate significant improvement in cost per axis for tactical grade IFOGs, below $700/axis with a goal of $500/axis while maintaining system performance requirements in completed gyros. Overall goals of flexible manufacturing ATD are to demonstrate 60% cost reduction in fiber optic components, integrated optics circuits, and over 75% reduction in touch labor. By FY2000, demonstrate cost goals of less than $500/axis for tactical grade and $1500/axis for navigational grade units, demonstrate suitability to critical weapons applications such as AMRAAM, ERINT, JAVELIN, LONGBOW, AIM-9X, F-22, F-18 E/F, RAH-66, JSOW and possibly JDAM if that system requires inertial measurement units. New cargo aircraft such as C-17 and NDAA and theater control systems such as JSTARS and AWACS will also directly benefit from affordable availability of precision grade IFOGs. AMRAAM Lots 8 and 9 are the primary current transition target for the tactical grade demonstration units, and IFOGs are currently scheduled for integration during a planned product improvement in these lots. Primary challenge of this ATD is to demonstrate multiple-grade capability being manufactured on a single integrated process line, thus providing surge capability, delivery rate flexibility, and minimal overhead by eliminating the need for dedicated manufacturing and assembly lines for each performance grade.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	22.9	24.4	8.4	0	0	0

MP.11.11.A Mobility, Countermobility, And General Engineering. Provides support of strategic, operational, and tactical mobility missions required for force deployment, employment, and sustainment. Development of lightweight and/or innovative adaptation of construction materials and criteria for their use with analytical software that replicates nonlinear material behavior for accurate assessment of mobility/countermobility and structural response during military operations will reduce engineer equipment and manpower requirements by 25%, maximize use of the available transportation infrastructure, and reduce wave heights to support Logistics-Over-The-Shore (LOTS) operations during adverse sea-states. By the end of FY97: develop a global, all weather, near-real time, cross-country ground mobility assessment capability; develop initial counter-mobility planning and transportation infrastructure evaluation software suites. By the end of FY98, provide technologies for use of expedient materials and methods to reduce construction and maintenance of operating surfaces worldwide by 25%, including regions with unique permafrost conditions and freeze/thaw cycles. By the end of FY02: develop civil engineering algorithms for assessment, maintenance of in-theater transportation networks; provide methods to assess, classify, and rehabilitate in-theater bridges; develop procedures and guidelines for using low quality/local materials for in-theater construction. (All software will be compliant with Command and Control Architecture and Distributed Interactive Simulation standards.)

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	5.7	4.9	3.1	3.7	3.7	3.8

MP.12.11.N Logistics Support For Expeditionary Forces And Naval Combatants. Develop and demonstrate the advanced technologies required to: (a) enable the rapid discharge of Amphibious Assault and Strategic Sealift ships in higher seastates up to 3, and from longer standoff distances up to 200 miles, and (b) extend the service life of the waterfront facilities required for the berthing, resupply, maintenance, and overhaul of Naval Combatants by an additional 20-30 years.

The specific developments include: By FY99, demonstrate new concepts for open-sea connectors, and larger more sea-worthy system configurations to provide an Amphibious Cargo Beaching Lighter (ACBL) that will increase operational availability for projected LIC/MIC scenarios in high sea state regions, such as the Far East, from 15 days/month to 25 while reducing in-water assembly time from 5 hours to 2 and increasing cargo capacity from 1 M1A1 Abrams tank to 3. By FY00, integrate high-payoff structural diagnostics and modeling with high performance materials and corrosion arrestment techniques to provide methods to extend the service life of existing waterfront facilities and to upgrade them to satisfy new mission requirements, such as the increase in pier deck capacity required to perform more extensive pier-side ship overhauls using truck-mounted cranes having concentrated outrigger loads of up to 120 tons on 50 year-old piers that were not designed for any concentrated deck loading. Benefits include increasing repair durability from 3 years to 15 and providing new pier upgrade alternatives costing about $5M for a typical pier instead of the now required demolish then replace approach costing about $30M. By FY00, develop high strength air-liftable fuel containers and rapid fuel distribution technologies to enable the rapid delivery of fuel to Marine Expeditionary Forces during Operational Maneuver From The Sea (OMFTS) operations from standoff distances up to 200 miles. The current fuel delivery capability is limited to a 4 mile standoff distance. By FY01, overcome significant operational and safety barriers to the field use of high performance metal cutting and joining technologies to reduce the installation time for the Elevated Causeway (ELCAS) System from the present 9 days to 7.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	9.1	11.6	11.4	11.4	9.9	10.0

MP.13.11.FD Wartime Contingencies And Bare Air Base Operations. Demonstrate technologies for wartime contingencies and bare base operations to include airmobile shelters, utility systems, and rapid pavement repair systems reducing airlift, response time, and costs for execution of global reach doctrine. Supports establishment, operation, and recovery of mission critical facilities on mobile air bases that directly support DOD Global Reach capabilities. Includes development of new airmobile shelter systems reducing weight, thermal losses, and packing volume. Using innovative geometric designs and lightweight high performance composites will improve durability, reduce assembly manhour requirements, and lower costs increasing readiness and warfighting capability. New shelter systems will be demonstrated by FY97. Development of new lightweight generators exploiting advanced permanent magnet disk and rotary engine technologies and heat pump systems based on acoustic cycle technology will result in reduced logistics tails, lower energy costs, and reduced airlift requirements. Demonstrate new bare base generator by FY97. By FY99 develop new lightweight heat pump increasing efficiencies and further reducing weights and packing volumes. New technologies will advance state-of-the-art in solid oxide fuel cells and environmentally clean alternate fuel systems by FY02. Advanced waste disposal systems, large low signature shelters, and reduced logistics needs for bare base operations will greatly enhance our mobile warfighting capability and reduce costs for contingency operations.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	2.2	1.8	2.1	2.3	2.5	2.3

MP.14.06.AF Structures And Fortifications For Force Protection Against Conventional Arms. Develops and demonstrates technologies to protect the Force, from foxholes to fixed facilities, against weapon threats ranging from small arms to terrorist weapons through advanced conventional weapons with multispectral sensor capabilities. Provides (a) high-performance materials and criteria that defeat conventional and saboteur weapon effects, (b) characterization of nonlinear viscoelastic-viscoplastic material responses, and (c) software that replicates nonlinear material behavior for vulnerability assessments and subsequent recommendations for increased survivability of facilities, equipment, and personnel. By the end of FY97, develop expedient, modular protective systems that increase survivability of critical assets 10-70 percent depending on the scenario and demonstrate the application of reinforced-concrete/carbon-fiber composites to retro-harden facilities. Demonstrate Simplified Survivability Analysis for the joint warfighter at Prairie Warrior 96/97 and Task Force XXI Advanced Warfighting Experiment. By the end of FY99, develop high strength, high ductility material and retrofit techniques that increase resistance of conventional structures by 50 percent against weapons used by saboteurs. By the end of FY01, develop deployable protection packages with 25 percent less logistic burdens for light forces and demonstrate use of in-theater materials to harden bare-base facilities. By the end of FY03, provide technologies for hardening through use of high-performance materials, improved numerical models, and camouflage, concealment and deception (CCD).

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	1.7	1.7	4.2	4.4	4.1	4.4

MP.15.06.FN Fire Fighting Capabilities For The Protection Of Weapon Systems. Develop enhanced fire fighting agents, crash fire rescue vehicles, firefighter protective equipment, and firefighter training systems to increase protection of weapon systems against current and emerging operational and wartime fire threats. Fire fighting research will develop advanced fire fighting agents, equipment, and techniques required by DOD to effectively combat aircraft, shipboard, fixed and mobile weapon system, facility, munitions plant, and hazardous materials fires. New capabilities will be developed in this research area exploiting cutting edge chemistries for new more effective fire suppressing agents; cryogenic technology for improved firefighter body cooling and breathing air; machine vision and dual spectrum uv/ir for ultra fast/reliable fire detection; exploitation of advanced automation and navigation technologies for crash fire rescue vehicles for effective inclement weather crash rescue response; and virtual reality technology for more effective safe firefighter training systems. By FY97, demonstrate enhanced large frame aircraft fire fighting capabilities, fine water mist ship fire suppression system, and ultrafast water deluge fire suppression system for DOD munitions plants. By FY99, develop replacements for Halon 1211 and AFFF fire fighting agents and a hypergolic fuel vapor detection/fire suppression system for space lift facilities. By FY02, develop a day-night all weather emergency response fire crash rescue capability, an advanced fire fighter training system, and next generation aircraft fuel fire suppression agent.

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	FY96	FY97	FY98	FY99	FY00	FY01
Total	3.9	3.9	2.2	3.1	3.4	3.3

MP.16.11.AFN Airfields And Pavements To Support Force Projection. The objective is to support force strategic deployment from CONUS and operational employment in TO by providing improved reliable airfields and pavements. The objective will be obtained by developing criteria for design/repair/material systems. By the end of FY98, provide reliable airfields and pavements to support current generation of military and Civilian Reserve Air Force (CRAF) aircraft and vehicles through the use of local materials (which may be of inferior quality) and pavement binder modifications resulting in a 10 percent reduction in construction and maintenance cost. This objective will require new technologies for material characterization, specifically in non-linear visco-elastic and visco-plastic behavior and how that behavior affects airfield and pavement performance. By the end of FY99, provide construction/design/repair systems to decrease construction effort by 10 percent for expedient surfaces in TO for military aircraft and vehicles. By the end of FY02, provide reliable airfields and pavements to support multiple passes of proposed future generation aircraft. Specific aircraft that can damage airfields include C-141, C-17, and the proposed million pound aircraft. Vertical/short take off and landing aircraft also pose a significant problem. In general, aircraft loads will continue to increase but the landing gear for proposed cargo aircraft will remain similar to the Boeing 777 configuration. Larger landing gear are not desirable because they consume too much of the cargo space. Therefore, the load per tire and tire pressures will continue to increase resulting in the need for airfields with an increased load carrying capability. The technical barriers to this effort include the need for a better understanding of multiple tire interaction, dynamic loading, and the linear and non-linear material response to those loadings. This objective will increase the functional life of airfields and pavements by 10 years resulting in a 20 percent reduction in maintenance costs and a 10 percent reduction in construction costs.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	0.7	0.7	2.7	2.6	2.5	2.6

MP.17.06.ANFED Hazardous And Toxic Waste Treatment/Destruction For DoD Operations. Develop, demonstrate, and implement cost and mission effective advanced technologies for the treatment, reduction of waste volume, or complete destruction of pollutant emissions to air, water, and soil from operations and maintenance of ships, aircraft, weapons systems, and installations required under local, state, federal and international environmental laws: a) Thermal Plasma Arc pyrolysis (ATD 97-99) and Supercritical Water Oxidation (FY98) for a 99% volume reduction in shipboard waste to enable global unrestricted Fleet operations, eliminate shipboard health hazards and avoid retrograde waste disposal in the US; b) Non-Thermal Plasma (FY97), Regenerative Sorbents (FY97) and Advanced Catalysis (FY99) to reduce NOx air emissions by 90% from jet engine test cells, aerospace ground equipment, and jet aircraft and risk-based atmospheric emission decision tools to improve space launch vehicle availability. Together these air quality technologies achieve $250M annual cost avoidance and avoid decreased or interrupted operations tempo; c) Biotechnology (FY02), Reductive Electrochemical Processes (FY00), Advanced Oxidation (FY97), and Advanced Chemical Reactors (FY00) for treating wastes from the manufacturing and disposal of Propellants, Explosives, and Pyrotechnics (PEP) and other complex and difficult to treat hazardous wastes from industrial maintenance, and operational installations. These technologies will reduce current annual hazardous waste disposal costs by up to 50% ($75M).

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	14.9	17.1	19.7	23.7	20.8	23.2

MP.18.06.AFD Cleanup Of Contaminants. Provide cheaper and more effective technologies for characterization and treatment of soils and groundwater contaminated with hazardous and toxic wastes from past DoD activities currently estimated at over 21,000 sites and a total $30-35B cleanup cost. FY98: Advanced sensors and samplers for on-site, real-time detection/monitoring of explosives/energetics, volatile organic compounds, and heavy metals - 50% cost savings over monitoring well / analytical laboratory processes. FY98: Bioremediation for explosives/energetics (ex-situ) and for fuels and chlorinated solvents (in-situ) - reduce costs and/or enhance cleanup efficacy by 50%. FY98: Environmental risk assessment framework - reduce cleanup design costs by 20%. FY99: Rapid detection and in-situ treatment of dense non-aqueous phase liquids (DNAPL) - reduce costs by 50%. FY00: Multi-sensor/multi-spectral array for remote detection of surface/subsurface unexploded ordnance - 35% cost savings. FY01: Fate and transport models/simulations integrating earth media - rapid contaminant fate predictions, improve risk assessment, and reduce design costs by at least 30%. FY01: In-situ heavy metals extraction - reduce costs by 50% and treat below existing structures. FY02: In-situ biotreatment of explosives/energetics - more reduced cost of 60% over FY98. FY03: Hybrid sensors/ samplers for real-time detection/ monitoring of chemical agents and enhanced DNAPL detection - 50% cost savings. FY03: Advanced groundwater remediation - increase treatment efficacy and flexibility with overall cost reduction of 75% over FY95. Implementation of all of the above technologies could provide an estimated savings in cleanup costs of as much as $10B.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	20.9	22.8	22.7	20.7	10.5	10.0

MP.19.06.NFD Metal Cleaning Processes And Coating Materials. Develop, demonstrate, and transition environmentally compliant surface preparation/metal cleaning processes, and paints and coating materials for military systems; provide solid state, non-aqueous and non-VOC cleaning processes for aircraft components; develop military coatings that protect against environmental degradation and present passive counter measures against enemy threats without toxic ingredients or high concentrations of volatile organic compounds (VOCs); meet pollution prevention requirements of E.O. 12856 to reduce toxic releases and off-site transfers by 50% by 1999. By FY96, Non-toxic, Inhibited Organic Coatings for aircraft and weapon systems will replace current inhibited coatings that contain lead and chromate, and NON-HAP Formulated Paints for DoD applications will be compliant with environmental regulations. By FY97, surface cleaning processes used prior to painting and plating, based on the use of solid particulate materials, UV light and activated oxygen, and Biodegradable Solid Media Blasting for aluminum surfaces will be developed for aircraft manufacture and maintenance. BY FY97, Non-toxic, non-VOC, LO (Low Observable) Coatings as well as low-VOC polymer binder systems will be ready for tech/demo on aircraft and missile airframes. By 1997, easy release anti-fouling coatings for ship hulls will be produced without the use of toxicants such as copper and tin. By 1998 and beyond, Oxygen Plasma Cleaning Processes for Oxygen Tubing, low-VOC ship paints; Chemical Agent Resistant Coatings, (CARCs); and aircraft coatings with supercritical CO2 as diluent vice toxic solvents will emerge.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	6.5	4.6	2.2	1.5	1.0	.08

MP.20.06.AD Sustainable Land Use for Training and Testing. Provide technology for environmentally sustainable training and testing on land. Develop tools to quantify and predict the impacts of land usage, and understand the associated military and environmental risks. Package the technologies into integrated systems for balanced analysis and support of land use decisions. Benefits include improved training realism and safety, reduced downtime, reduced maintenance costs for equipment and land, increased flexibility in land use, and no loss of training lands due to overuse.

By improving training conditions (uninterrupted realism) such that corrective retraining is reduced by one day per division per year, and equipment maintenance costs reduced by 1%, savings of $12.2M per year could be realized for the Army, and an estimated $4M annually for other services.

By FY99, land-based carrying capacity models incorporating training practice impacts and alternatives will be available. A decision support system for land rehabilitation and technologies for modeling mission impacts on protected species will be ready by FY01.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.6	3.3	5.2	6.6	4.1	3.3

MP.21.06.ANFS Affordable Industrial Processes, and Practices. Demonstrate a strategic manufacturing approach based on "lean production" concepts and practices used by the world's most successful companies on small DoD production quantities comparable to the cost benefits normally expected in higher volume industries. Acquisition costs in defense sectors of aircraft, rotorcraft, shipbuilding, armored vehicles, and rations will be impacted. Expand the envelope of flexibility to produce military components and systems on commercial production lines by demonstrating combinations of business practices and information technologies between DoD and defense prime contractors compatible with effective commercial supplier partnerships. By FY1997, demonstrate efficient business and management practices for production of military electronics products on commercial lines. By FY1998, demonstrate a common quality system within a facility acceptable to all military and commercial customers; and, mutually beneficial, long-term, best value supplier relationships for key sector critical components. By FY2000, demonstrate the combined benefits of low cost, shorter span time, and high quality for low volume defense production qualities; double the inventory turns per year of components and electronics components by using commercial enterprise and production practices; and transition the commercial manufacturing cost and cycle time benefits to components for rotorcraft, ground vehicles, ships and water vessels. By FY2005, demonstrate the benefits for lean, integrated commercial-military manufacturing in relevant key sectors for at least one new or redesigned military system in each Service.

Customers: F-22, C-17, F/A-18E/F, RAH-66, Longbow Apache, Shipyards, Defense Primes.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	25.0	33.7	20.0	18.9	19.2	23.1

MP.22.06.ANFS Capable Manufacturing Processes. In FY1996, continue to develop and demonstrate affordable and robust composites, electronics and metals processing and manufacturing technologies for advanced materials and complex components directed at key issues of cycle time reduction, first pass yield cost reduction, six sigma part quality, improved design/manufacturing integration, and environmentally safe/compliant manufacturing process.

Composites: Demonstrate the benefits of implementing integrated product and process develop (IPPD) on composite structures for both acquisition and supportability programs. By FY1997, fabricate and flight test two multi-functional radome prototypes for the RC-135 and qualify polymeric sabots for 25 mm M919. Meet, low cost manufacturing goals in FY1999 for engine ducts and airframe aft fuselage skin for the F-18 E/F. By FY2000, provide a 50 percent reduction in composite fabrication costs and 75 percent reduction in design time and engineering changes for bonded wings, fighter wings, and engine ducts. By 2005, reduce the cost of selected composite structures to 1-1.5 times the cost of aluminum structures for the Commanche keel beam.

Electronics: Develop and demonstrate electronic components capable of high performance functioning under harsh environmental conditions. FY1997, demonstrate automated production for C-band transmit-receive modules for the Navy's Cooperative Engagement Program. Transition sealed Ni-Cd aerospace battery process improvements to the factory floor. In FY1998/1999, demonstrate Industrial capability in high efficiency solar cells. In the longer term, six sigma manufacturing will be available for digital and analog chips and flexible manufacturing processes will be in place for IRFPAs, multiple bandgap solar cells and IFOGs.

Metals: Current and future weapon systems require more affordable and robust manufacturing processing methods for metal forming, consolidation, mass reducition, changing properties and surface modification. Improved and advanced joining technologies are also mandatory. The FY1997 goals to reduce the cost of welding titanium structure 30-50 percent for Air Force and Navy weapon systems. Design and process optimization will provide a 50 percent weight reduction for the SLAT missile. High speed machining initiatives will lead to a 50 percent reduction in tooling and manufacturing man-hours for metal parts for fighter aircraft (F-22).

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	165.4	116.8	129.5	79.6	83.1	80.6

MP.23.06.ANFES Affordable Short-Lead-Time Repair and Low Volume Production. Develop and demonstrate the tools, methods, and practices for supply chain integration and factory command, control, and communication leading to shorter weapon systems production cycle time, significant cost reduction, and improved industrial base strength in DoD critical sectors. Adapt lean commercial practices in supplier selection, continuous improvement, electronic data interchange, and commercial-military integration to key DoD sectors of airframes, electronics, ship, ground vehicles, tactical missiles, and conventional munitions. Modify business and management processes for multiple-tier supplier teams for design, engineering, information sharing, and manufacturing of weapon system components and subsystems. By FY1997, validate cost savings, management effectiveness, and delivery benefits for subsystem materials and components in aircraft, ground vehicles, and ships, and demonstrate the capability for continuous instantaneous knowledge of location and status of all hazards materials. FY1997, demonstrate integrated scheduling for several electromechanical military products. FY1998, demonstrate technologies and tools to integrate factory scheduling and real-time work order status in mechanical products to permit even, predictable throughput with much lower raw material and in-process inventories. FY2000, demonstrate the capability to quickly retrieve and integrate product and process models in order to shorten generation and release of work orders form 270 days to 30 days. FY2005, demonstrate target costing processes, slack time management, design flexibility, cycle time and qualify for DoD electro-mechanical subsystems. Specific goals include 50 percent reduction in production span times, and 70 percent reduction in-process inventories for all selected classes of assemblies which could reduce unit production costs of modern fighter aircraft by $10M - $15M.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	49.9	30.2	22.0	4.9	5.8	8.0

F. DEFENSE TECHNOLOGY OBJECTIVES FOR BIOMEDICAL SCIENCE AND TECHNOLOGY

MD.01.J00.ANF	Sustained Operations Enhancement Ensemble
MD.02.J00.A	Vaccines for Prevention of Malaria
MD.03.J00.AN	Blood Loss, Blood Products and Fluid Resuscitation
MD.06.J00.A	Prevention of Diarrheal Diseases
MD.08.J00.ANF	Laser Bioeffects Countermeasures
MD.09.J00.ANE	Advanced Medical Technology . Field Medical Support [Joint Program With Combat Casualty Care Subarea]
MD.10.J00.ANF	Toxic Hazards Evaluation Tools
MD.11.J00.AN	Management and Treatment of Combat Trauma and Severe Hemorrhage and Sequelae
MD.12.J00.A	Antiparasitic Drug Program
MD.13.J00.ANF	Radio Frequency (RFR) Radiation Bioeffects Countermeasures

MD01J00ANF Sustained Operations Enhancement Ensemble. Develop and adapt countermeasures to the behavioral and physiological degradation due to demands for sustained operation to missions, scenarios, and systems. Research will ensure that personnel will perform optimally in all environmental/operational extremes. By FY97, field operational doctrine for pharmacological intervention to counter fatigue and sleep loss in military operations, improving performance at 72 hours without sleep by 20%. By FY99, field joint guidance for commanders, integrating knowledge of sleep loss, melatonin, shift work schedules, and performance decrements for conducting rapid deployments and sustained operations to reduce performance decrements by 25%.

Justification. Fatigue during extended contingency operations limits unit operational effectiveness and jeopardizes safety. Stress and fatigue will be the primary or secondary cause of a large number of casualties. These factors can become the primary agents of mission failure. For example, 26% of major non-ejection accidents in combat aircraft are attributable to failures of attention and 15% are attributable to fatigue and circadian phenomena.

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	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	10.7	6.9	7.4	8.9	9.2	9.4

MD02J00A Vaccines For Prevention Of Malaria. By FY00, demonstrate safety and efficacy sufficient to justify transition to advanced development of a multiantigen, multistage malaria vaccination process to prevent *Plasmodium falciparum* infection in 80% of immunized troops. By FY02, demonstrate safety and efficacy sufficient to justify transition to advanced development of a vaccination process to prevent 80% of immunized troops against both *P. falciparum* and *P. vivax* malaria.

Justification. Malaria is a medical threat to U.S. troops deployed to the tropical regions of Africa, Asia, South and Central America and the Pacific. In Vietnam, infection rates reached 600 per 1,000 soldiers per year. Current control of malaria depends on prophylactic drugs. An effective vaccine will overcome parasite resistance and reduce the need for troops to take antimalarial drugs.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	4.1	3.5	3.6	3.3	3.2	3.2

MD03J00AN Blood Loss, Blood Products And Fluid Resuscitation. By FY98, demonstrate safety and efficacy sufficient to justify transition to advanced development of a field-portable infusion-fluid warming device. By FY99, double the storage life of liquid whole blood and blood products. By FY99, define optimum resuscitation perfusion pressures, volumes and temperatures for early vs. delayed field resuscitation of hemorrhage which will improve survival by 10%. By FY01, demonstrate and complete evaluation of candidate products for local hemostasis to keep 20% of hemorrhages from becoming life-threatening.

Justification. In the prehospital setting of modern battlefields, where 50% of combat deaths are due to hemorrhage, a significant number of lives can be saved by stopping hemorrhage from becoming life-threatening, or by quickly, efficiently, and effectively resuscitating massive blood loss. This DTO develops products which will allow field medics to accomplish both of these goals.

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Total	8.1	8.1	8.2	8.4	8.6	8.9

MD06J00A Prevention Of Diarrheal Diseases. Demonstrate safety and efficacy sufficient to justify transition to advanced development of candidate vaccines to protect 70% of troops from dysentery and profuse watery diarrhea as follows: by FY97, demonstrate safety and efficacy sufficient to justify transition of a *Shigella sonnei* vaccine and a killed, whole-cell Campylobacter vaccine. By FY99, demonstrate safety and efficacy sufficient to justify transition of a *Shigella flexneri* vaccine. By FY01, demonstrate safety and efficacy sufficient to justify transition of a *Shigella dysenteriae* and an Enterotoxigenic *Escherichia coli* (ETEC) vaccine.

Justification. Diarrhea affects 20-30% of soldiers deployed OCONUS. ETEC caused 55% of diarrhea cases during ODS/S and was a major problem in Somalia. Shigella caused 19% of the cases of acute diarrhea during ODS/S, and Campylobacter caused 60% of diarrheal illnesses during Cobra Gold. Effective vaccines will overcome antibiotic resistance, enhance strategic mobility, and reduce medical logistics requirements.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.8	2.7	3.0	2.6	2.5	2.5

MD08J00ANF Laser Bioeffects Countermeasures. Mitigate the impact of low-level, laser-induced glare on visually mediated human performance. By FY97, define the impact of low-level, laser irradiation-produced visual glare on visual performance. By FY98, integrate the information into a tri-service bioeffects model (Integrated Personnel Effects Model) to achieve full integration of recommendations regarding exposure limits. By FY97, validate models of laser-induced contrast reduction that includes effects of transparencies. By FY99, complete field evaluation of nonlinear optical materials for frequency agile laser eye protection.

Justification. The ability of even low-power lasers to damage the eye poses an especially relevant threat to military operations. Aviators are acutely vulnerable to laser light effects because of the time-critical nature of many visually guided tasks. The loss of visual sensitivity for as little as a few seconds during a crucial phase in a maneuver can seriously compromise mission readiness.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.7	3.4	3.6	3.9	4.0	4.2

MD09J00ANE Advanced Medical Technology - Field Medical Support [Joint Program With Combat Casualty Care Subarea]. Execute a multidisciplinary, multifaceted, effort starting FY97 which will reduce the likelihood of casualties and the severity of those casualties which occur. There will be a 25% reduction in casualties as a result of monitoring with the Personnel Status Monitor (PSM) and associated sensor systems. The system will employ an advanced physiological sensor packet (DATAPAK), advanced modules for collection and storage of medical data (MEDITAG/MEDTAB), computer-assisted monitoring, diagnosis, and mentoring (far-forward-WARRIOR MEDIC; Echelon 1+ Telemedicine) to reduce by 20% the number of wounded who now die before reaching medical care. The system will use an intensive care support evacuation platform (LSTAT; “Care in the air”) to reduce the evacuation burden now placed on non-medical personnel by 33%. This system will be fielded for a 2-year evaluation by FY01.

Justification. Provides commanders and health care providers with vital intelligence concerning medical aspects of the operational condition of their own forces to supplement the integrated battlefield sensor montage. It also includes a medical equipment ensemble capable of projecting elements of sophisticated medical monitoring and treatment to the farthest ends of the battlefield.

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Total	36.9	35.0	34.7	46.5	53.3	57.8

MD10J00ANF Toxic Hazards Evaluation Tools. By FY97, field improved test battery for assessing neurological and performance consequences of toxic exposure. By FY98, field Flow Injection Analysis techniques to develop a new family of precise real-time assay techniques. By FY99, develop and field pharmacokinetic models to determine the dose-effect relationships of operationally relevant toxic hazards.

Justification. Toxic hazard evaluation tools are needed to protect the warfighter from exposures to hazardous substances associated with and generated by military operations. Sources of potentially toxic exposures vary greatly, from solvents and fuels to smoke produced by fires in confined spaces.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.4	2.7	2.6	2.7	2.8	3.0

MD11J00AN Management And Treatment Of Combat Trauma And Severe Hemorrhage And Sequelae. BY FY00, demonstrate safety and efficacy sufficient to justify transition to advanced development of a pharmacologic intervention which will preclude or reduce ischemia/reperfusion injury by 20% or greater. By FY03, demonstrate safety and efficacy sufficient to justify transition of pharmacologic and/or device interventions to lower tissue oxygen requirements by 20%. Such products will be capable of reducing or preventing development of secondary injuries from combat trauma and massive hemorrhage, particularly brain and spinal cord injury by 20%.

Justification. Many combat deaths can be directly attributed to cellular and metabolic derangements following massive hemorrhage or trauma. Often, these cellular or metabolic events begin as cascades which manifest themselves days later as severe complications (secondary brain injury, multiple organ failure, etc.) or death. Consequently, products developed under this research effort are directed at preventing these delayed complications through more effective initial treatments, drugs, devices, etc. These research efforts will result in products which will save lives now lost to combat trauma and severe hemorrhage. This research will identify, evaluate, and transition initial trauma treatments or products which will more effectively abolish or attenuate complications arising from combat trauma.

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Programmed DTO Funding ($M):

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Total	11.2	10.9	10.3	10.5	10.6	10.8

MD12J00A Antiparasitic Drug Program. Demonstrate safety and efficacy sufficient to justify transition to advanced development of antiparasitic drugs that will prevent or treat 80% of infections caused by malaria or leishmania parasites. Candidates include: arteether (treatment of severe drug resistant malaria), FY96; topical paromomycin/gentamicin (cutaneous leishmaniasis treatment), FY96; atovoquone-proguanil (malaria prophylaxis), FY97; artelinic acid (malaria treatment), FY98; and floxacrine analog (malaria prophylaxis), FY01.

Justification. Epidemic malaria, up to 600 per 1000 soldiers per year, is a medical threat to U.S. troops deployed to tropical regions of Africa, Asia, South and Central America, and the Pacific. Chronic cutaneous and visceral leishmaniasis occurs in many of the same regions. Novel antiparasitic drugs are required to overcome parasite resistance to standard drugs.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	4.1	4.3	4.4	4.3	4.2	4.2

MD13J00ANF Radio Frequency (RFR) Radiation Bioeffects Countermeasures. Potential overexposure to RFR emissions and induced body-to-ground-currents is severely restricting the development and fielding of new critical military RFR weapon systems. To allow the full operational impact of these systems, a new dosimetry computer model will be developed by FY97. Bioeffects data will be generated to issue new safety guidelines by FY99. A personal RFR dosimeter will be fielded in FY01.

Justification. New RFR weapons and countermeasure technologies (e.g., HPM and ultra-wide band systems) produce emissions of completely unknown biomedical effects. These technologies, and the systems based on them, cannot be developed, tested, or fielded until necessary bioeffects data are obtained.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.8	2.0	2.0	1.9	1.9	2.0

G. DEFENSE TECHNOLOGY OBJECTIVES FOR SENSORS, ELECTRONICS AND BATTLESPACE ENVIRONMENT

SE.01.01.ANF	Multi-Mission UAV Sensor ATD
SE.02.02.N	Smart Skins Array ATD
SE.03.02.N	High Frequency Surface Wave Radar (HFSWR) Demonstration
SE.04.01.ANFE	Penetrating/Identification Radar
SE.05.01.ANFE	Affordable and Enhanced Radar Signal Processing
SE.06.01.A	Air/Land Enhanced Reconnaissance and Targeting (ALERT) ATD
SE.07.02.ANF	Advanced Pilotage
SE.08.02.A	Target Acquisition ATD
SE.09.02.A	North Finding Module
SE.10.02NF	EO Sensor, Fusion, and Targeting
SE.11.01.ANFE	Advanced Infrared Search and Track (IRST) Systems
SE.12.02.ANF	Multi-Wavelength Multi-Function Laser
SE.13.03.NF	Aircraft Signature Measurement/Modeling Technology
SE.14.02.N	Lightweight, Broadband Variable Depth Sonar (Acoustic, Magnetic, Seismic)
SE.15.01.ANE	Sensor Signal Processing Technology (Acoustic, Magnetic, Seismic)
SE.16.01.NE	Active/Passive Sensor Technology (Acoustic, Magnetic, Seismic)
SE.17.01.ANFEC	ATR Dominant Target ID
SE.18.02.NFE	Integrated Platform Avionics Demonstrations
SE.19.01.NF	Compact High Power RF Transmitters
SE.20.01.AFE	Affordable Multi-Chip Modules for Phased Array Antennas
SE.21.01.AFE	Low Power Consumption RF Electronics
SE.22.01.ANFE	Advanced IRFPA
SE.23.01.E	Militarized Flat Panel Display Technology
SE.24.01.ANFE	Optical Control of Radar, Comm. and Electronic Warfare Systems
SE.25.01.NFE	High Performance Microelectronics for Signal Processing and Computing
SE.26.01.AFH	Radiation Resistant Microelectronics

SE.27.01.E	Microelectromechanical Systems
SE.28.01.FE	Integrated Design Environment Technology

G. DEFENSE TECHNOLOGY OBJECTIVES FOR SENSORS, ELECTRONICS AND BATTLESPACE ENVIRONMENT (CONT.)

SE.01.01.ANF Multi-Mission UAV Sensor ATD. In order to effectively plan operations and engage targets beyond line-of-sight in inaccessible regions, DoD forces require UAV borne sensors with data links back to forces which can plan and execute missions. A Multi Mission UAV Radar Payload will demonstrate a low cost, lightweight, multi-function sensor and signal processor capability that will provide the battlefield commander with continuous, real-time, all-weather capability to detect, locate, and identify high priority fixed and mobile targets in all theaters of operation. A moving Target Indicator/Synthetic Aperture Radar sensor will be integrated in the objective UAV, along with a Line of Sight Data Link for Display on the objective Ground Control Station. A commercial processor approach to the sensor will provide enhanced capability for target cueing. MIMIC technology will be incorporated to reduce size and weight. The sensor data will be integrated in the Common Ground Station and UAV Ground Control Station. By FY97, Mission requirements and payload design will be determined. By FY98, candidate sensors and signal processor will be selected and development initiated. By FY99, sensor development and payload integration will be completed, captive flight tests initiated and interface documents for Common Ground Station will be prepared. By FY00, Performance testing and operational demonstration in support of early entry and deep attack scenarios completed.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	0.4	1.9	4.5	6.1	7.0	0.2

SE.02.02.N Smart Skins Array ATD. The need to locate and ID stealthier targets requires options for enhancing sensor capabilities on platforms with restricted real estate. If sensors can be embedded in the structural pars of platforms, many options become available for designing sensors in the structure itself. This is particularly critical for radar sensors. This ATD is demonstrating the technical feasibility, operational utility, and support benefits of structurally embedded antenna arrays. By FY96, demonstrate Sub-Array test models. By FY97, demonstrate smart skins array on F-18 Leading Edge Flap ADM. F-18 Low Observable Leading Edge Flap, and Pole Model F-18. By FY98, conduct F/A-18 C/D ADM validation/flight test. By FY99-FY01, validate on:

Aircraft: F/A-18 C/D, E2-C, S-3, P-3, JAST
Submarine: Antenna Mast: SATCOM: Comm/Weapon Link
Ships: CEC: SATCOM: Fleetcomm, Radar

Svr/Agency POC:	USD(A&T) POC:	Customers:
Jim Hall, ONR,	John Transue	Drew Glista, NAVAIR,
DSN 226-5754	(703) 614-0212	(703) 604-3027

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	3.6	4.2	0	0	0	0

SE.03.02.N High Frequency Surface Wave Radar (HFSWR) Demonstration. The advent or Mach 2+ Antiship Cruise Missile has reduced the depth of fire to, at most, one engagement under good conditions. If a first engagement can be moved out to the horizon, depth of fire could be increased to two. This ATD is aimed at demonstrating over-the-horizon detection of low-flying anti-ship missiles by a shipboard radar operating in the high frequency band near 20 MHZ. Detection and tracking of the targets will exploit sea \-surface hugging features of surface wave propagation. The HFSWR will provide critical early warning (30 sec for a M2.0 target) of missile attack and cueing of weapon engagement radars. Critical issues to be addressed by the demonstration include compatibility of the radar with other shipboard HF systems and the effects of the complex shipboard scattering environment on target detection and tracking. Target transitions include both forward fit (CVN-76 and SC-21) and backfit (LSD-41 class, and other ships slated for the self-defense system). The HFSWR is currently under development for testing on the Self-Defense Test Ship (SDTS) and LSD-41-class ship. Fabrication and factory testing of the radar will take place in FY96; at-sea testing will begin in Jan 97 and extend throughout FY97. Performance goals include detection of supersonic sea-skimming missile at two-an-a-half times the range currently achievable with a microwave radar, with better than a 1.0-deg azimuth tracking accuracy.

Svr/Agency POC:	USD(A&T) POC:	Customers:
J. Hall, ONR	John Transue	PEO(TAD) A. Supsiri
(703) 696-5754	(703) 614-0212	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	6.0	4.0				

SE.04.01.ANFE Penetrating/Identification Radar. The use of foliage, buidings and ground, by enemy forces, to hide targets jeopardized the U.S. and friendly personnel and slows the pace of engagement. To improve knowledge of the battlespace, ultra wideband and narrow band radar and radiometric technology to detect and identify tactical targets in the clear and hidden in foliage, buildings, or beneath the ground. Optimum foliage penetration (FOPEN), building penetration (BPEN) and ground penetration (GPEN) frequency bands with appropriate bandwidths will be determined. Single and multi-static radars and passive technology will be developed to meet target detection requirements and platform constraints. Different radar processing techniques will be developed to meet different medium penetration. Synthetic Aperture Radar techniques will be developed to gain fine target resolution. Advances will be made in clutter and interference rejection, target resonances and other identification phenomonology, and very low sidelobe imaging techniques for efficient implementation on military platforms. To enhance warfighting capability, real-time target detection and recognition capabilities will be implemented to expedite target data dissemination through the battlefield situation awareness network. Demonstrate in FY97, foliage penetration (instrumentation grade hardware). In FY98, demonstrate building penetration (instrumentation grade hardware). In FY99, demonstrate ground penetration (instrumentation grade hardware). In FY01, initiate development of prototype hardware for tactical platform demonstration.

Enhance battlefield situation awareness by developing and demonstrating an ultra wideband Synthetic Aperture Radar on a UAV platform to detect tactical targets hidden both in foliage and beneath the ground. Optimum foliage penetration (FOPEN) and ground penetration (GPEN) UHF band with bandwidth greater than 600 Mhz will be used. To enhance warfighting capability, real-time target detection and recognition capabilities will be implemented to expedite target data dissemination through the battlefield situation awareness network. In FY99, the UWB SAR will demonstrate detection of armored vehicles, missile launchers, trucks, and other vehicles concealed or camouflaged under tree canopies. In FY01, demonstrate detection of underground mines, bunkers, communication wires, tunnels, and other man-made objects.

Svr/Agency POC:
Allan Tarbell, CERDEC/NVESD
908-427-3103

USD(A&T) POC:
Susan Turnbach
DDR&E
(703) 695-0005

Customers:
D&SA BL, Mounted BL, EELS BL, US Central Command, US European Command, US Force Command, JPO UAV

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	30.3	35.7	35.9	39.0	14.1	5.8

SE.05.01.ANFE Affordable and Enhanced Radar Signal Processing. In order to improve battlespace awareness, detection and identification of potential targets must be increased. This is particularly true in a stealthier, faster moving battlespace in a cost effective manner. This effort seeks to develop advanced signal processing techniques and radar architectures which fully leverage commercial technology in hardware, software, and operating systems to drive down cost and enhance capability. Rapidly insert advancing capabilities of commercial computer technology into tri-service, military systems to greatly enhance radar performance capabilities in these mission areas. This advanced computing capability will allow the use of the technology developed under this to improve SAR image formation and motion compensation, moving and stationary target discrimination, clutter rejection, target identification and all-digital radar front ends. The benefits provided include enhanced target detection in clutter and jamming, higher resolution target imaging, reduced cost, size, power consumption, weight, and complexity. By FY98, autonomous adaptive clutter rejection for STI radar. By FY00, demonstrate super resolution techniques for real beam radars. By FY03, demonstrate space-based theater surveillance (Space JWACST)

Svr/Agency POC:	USD(A&T) POC:	Customers:
Carolyn Nash	Susan Turnbach	
SARD-TT	DDR&E	
DSN 227-8433	(703) 695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	25.5	31.7	32.7	31.1	28.5	29.9

SE.06.01.A Air/Land Enhanced Reconnaissance and Targeting (ALERT) ATD. The objective of this ATD is to identify stationary and moving targets. The fast pace of many engagement scenarios requires a significantly improved capability to demonstrate the ability to automatically acquire stationary and moving targets from a highly dynamic platform such as a scout/attack helicopter by FY00. ALERT will exploit emerging developments in search-on-the-move ATR algorithms, including long range detection, target identification, scene/scan correlation, smart sensor management, and temporal FLIR processing for MTI. ALERT will also evaluate the additional benefit provided through enhanced laser rangefinder functionality. By FY98, demonstrate baseline on-the-move performance using 2nd GEN FLIR and standard rangefinding mode. By FY99, integrate laser range mapping capability and enhanced on-the-move search/detection algorithms. By FY00, integrate laser profiling capability to demonstrate target identification and transition to the Survivable Armed Reconnaissance on the Digital Battlefield ACTD. Demonstrate the ability to provide long range detection (in excess of 4000 m) from a platform moving at speeds of up to 180 kts. Demonstrate that automation can extend the safe ingress rate of the platform by 50-75% for full threat coverage over manual acquisition. Demonstrate search correlation false alarm suppression modes to reduce false alarm rate to meet RAH-66 Comanche requirements.

Svr/Agency POC:	USD(A&T) POC:	Customers:
Carolyn Nash	Susan Turnbach	Mounted BL, D&SA BL, BC BL,
SARD-TT	DDR&E	EELS BL
DSN 227-8433	(703) 695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	--	1.3	5.8	5.8	1.9	0

SE.07.02.ANF Advanced Pilotage. The Warfighter must be capable of fighting day or night in all environment in the execution of his or her primary mission. This DTO develops and demonstrates advanced pilotage technology for night and adverse weather pilotage/navigation for aircraft and surface craft to enhance survivability. By FY97, develop and flight test an image intensified sensor and fast (60 Hz) focal plane array for a wide field of view FLIR. Demonstrate a 50% improvement in resolution for both poor thermal conditions and starlight, and a 25% increase in field of view over currently fielded systems. By FY98, demonstrate an integrated, wide field of view pilotage/navigation sensor and display suite with image fusion. Image fusion combines the most salient features from the complimentary FLIR and image intensified sensor imagery to show a single, complete picture of the operating area on the pilot's helmet mounted display.

Svr/Agency POC:	USD(A&T) POC:	Customers:
Carolyn Nash SARD-TT DSN 227-8433 James Buss ONR DSN 226-0590	Susan Turnbach DDR&E (703) 695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	7.5	8.0	7.7	0	0	0

SE.08.02.A Target Acquisition ATD. To effectively employ weapon systems at night or in poor visibility, the Warfighter must have full knowledge of the battlespace in real-time. The Target Acquisition ATD provides this capability. BY FY98, develop and demonstrate an extended range, multi-sensor target acquisition suite for future tank, cavalry, and scout vehicles. The multi-sensor suite will consist of a second generation thermal imaging sight with automated widefield-of-view search and aided target recognition, a low cost MTI radar (growth to STI), and a multi-function laser. These enhanced target acquisition capabilities will be coupled with combat identification technologies to significantly improve the light armored combat vehicle's lethality and survivability. Identification range will be extended 67% for exposed targets and 50% for partially obscured targets. Automation will reduce search timelines by 60-80% over manual search and streamline crew workload for future main battle tanks.

<u>Svr/Agency POC:</u>	<u>USD(A&T) POC:</u>	<u>Customers:</u>
Carolyn Nash	Susan Turnbach	
SARD-TT	DDR&E	
DSN 227-8433	(703) 695-0005	

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	6.2	8.3	1.9	0	0	0

SE.09.02.A North Finding Module. Situation awareness and knowledge of both the enemy and friendly force location are critical to the warrior to effectively engage. The North Finding Module development provides the warfighter with an accurate means of determining azimuth. By FY97, demonstrate a compact, self contained, affordable ($5-$10K/unit), azimuth measurement device with an accuracy of 5 to 10 mils and the capability to provide initial measurements within 3 minutes when static or 1 minute when moving. More accurate and timely azimuth data is critical to target handoff accuracy, use of situational awareness data for Combat ID and full use of GPS data. The North Finding Module will overcome weakness of GPS alone (jamming, occlusion, multipath etc.) through the use of inertial measurement systems (Interferometric Fiber Optic Gyro, Dynamically Tuned Gyro) and will provide synergy with GPS on the digital battlefield at a low cost-performance ratio. The module could also be used on instrumented ranges such as the National Training Center as a sensor for battle control and scoring.

Supports: Hunter Sensor Suite, Remote Sentry, Precision Guided Mortar Munition, Objective Combat Weapon ATDs; RFPI; PM Combat ID, PM Mortars.

Svr/Agency POC:	USD(A&T) POC:	Customers:
Jonathan Barnstein	Susan Turnbach	Mounted DFD,
ARL-WT	DDR&E	(502) 624-1963,
(410) 278-3737	(703) 695-0005	DSN 464-1963

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	1.0	0.3	0	0	0	0

SE.10.02.NF EO Sensor, Fusion, and Targeting. Allow targeting capability in an expanded battlespace with improved precision for direct fire, indirect fire, precision guided weapons and enhanced location and identification of a wider variety of targets. Capitalizing on emerging electro-optical sensor-based approaches incorporating advanced focal plane arrays, image and sensor fusion, automatic target recognition, precision designation and location and C4I to sharply increase the target acquisition and target ID range, target location accuracy, multiple target tracking capability and target servicing rates. Applications include precision target hand-off and capture among surface-to-surface and air-to-air platforms. By FY99, demonstrate system integration. By FY00, demonstrate 40% target ID range improvement and 100% reduction in target location error for surface-to-surface platforms. By FY02, demonstrate fixed-wing air-to-surface weapons launched beyond 15 km. Demonstrate surface-to-surface sensor-to-shooter command and control interface to reduce cycle time for indirect and precision strike fire to time-of-flight plus 40 seconds for surface-to-surface platforms.

Svr/Agency POC:	USD(A&T) POC:	Customers:
Dennis Van Derlaske, CERDEC/NVESD 703-704-1258	Susan Turnbach DDR&E (703) 695-0005	Mounted BL, EELS, BL D&SA BL
Hank Lapp, Air Force WL		
Jim Buss, Navy, ONR		

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	3.4	3.5	4.5	4.5	5.4	5.1

SE.11.01.ANFE Advanced Infrared Search and Track (IRST) Systems. Develop and demonstrate autonomous and affordable passive IRST capabilities for over-the-horizon targeting of TBMs at extended range, horizon detection of cruise missiles for ship self defense, detection and precision tracking of threat aircraft for ground combat vehicles, and air-to-air warfare. By FY96, conduct static demonstration of IRST combat vehicles. By FY97, collect data to support development of shipboard IRST capable of detecting cruise missiles and aircraft in littoral environment and demonstrate limited on-the-move IRST operation on a combat vehicle. Transition to Engineering Development surveillance IRST capable of autonomous detection and precision tracking of aircraft and theater ballistic missiles at ranges beyond 500 km, in a sensor configuration compatible with carrier-based surveillance assets (i.e., E-2C). Application of staring focal plane arrays and digital signal processing provides high performance in a small aperture, in turn, facilitating compact and affordable systems for tactical aircraft (e.g., F-22, F/A-18, JAST techniques).

Svr/Agency POC:
Navy: Jim Buss, ONR, DSN: 226-0590
Army: Carolyn Nash
SARD-TT
DSN 227-8433

USD(A&T) POC:
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DDR&E
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Customers:
Air Defense School (Army), Mounted BL, D&SA BL, BC BL, EELS BL
Cpt. Shepard PMA-231

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	11.5	9.1	5.4	2.5	1.4	1.4

SE.12.02.ANF Multi-Wavelength Multi-Function Laser. Develop and demonstrate high efficiency, compact, laser diode pumped, wavelength diverse laser source in the 0.26 - 5 micron spectral region and system controller software for multi-functional applications. By FY96, demonstrate low to moderate (1KHz) repetition rate laser with multiple mode operation. By FY97 develop modules with multiple wavelength outputs from 0.26 - 10 microns obstacle avoidance, biological agent detection, rangefinding, enhanced target recognition, and laser radar for integration with vehicle target acquisition sensors. By FY98, develop compact modules for multiple applications and integrate laser modules with Target Acquisition ATD. By FY99, complete development of multi-application software and investigate Horizontal Technology Integration approach to multi-function and multi-application laser sources.

During battle conditions the Warfighter must be able to accomplish multiple goals such as range finding, target designation and identification with a minimum of equipment to maintain battle tempo.

Svr/Agency POC:	USD(A&T) POC:	Customers:
Carolyn Nash	Susan Turnbach	PEO-Aviation,
SARD-TT	DDR&E	PM-ASM, PEO-IEW
DSN 227-8433	(703) 695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.5	3.5	5.7	5.1	3.7	4.6

SE.13.03.NF Aircraft Signature Measurement/Modeling Technology. Demonstrate, by 1997, an ability to accurately predict the infrared signature of aircraft and cruise missiles for a variety of altitudes, speeds, power settings, and environmental conditions. This prediction capability will reduce the number of flight test hours required to characterize the target signature by over 50%. Demonstrate, by 1999, the ability to integrate these target signature models into missile engagement models, and thereby reduce the number of flight test hours required for decoy effectiveness testing by 25%. Demonstrate, by 2001, the ability to predict the signature of the F-022 Advanced Tactical Fighter and determine the infrared specification compliance for the program. The use of this signature prediction capability will reduce the number of flight test hours by over 50% from classical electro-optical signature flight test procedures.

This supports the Aerospace Systems Center in their development of the F-22 Advanced Tactical Fighter, the Air Combat Command in their tactical analyses for the F-15, F-16, F-117, B-1, and B-2 aircraft, the Air Mobility Command in defensive systems testing for the C-130H, C-17A, C-141, and C-5 cargo aircraft, and Hq. AFOTEC in their operational test and evaluation of C-17, F-15, C-130J, and CV-22 aircraft. The target signature prediction models will be transitioned to STRATCOM, ACC, AFOTEC, AFIWC, and ASC for their test and evaluation analyses.

Svr/Agency POC:	USD(A&T) POC:	Customers:
ONR, Dr. W. Stachnik (703) 696-5752	Donald Dix (703) 697-7922	ASC, ACC, AMC, STRATCOM, AFIWC, AFOTEC, and PEO(TAD) J. Misanin

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	1.7	1.3	1.2	1.4	1.4	1.4

SE.14.02.N Lightweight, Broadband Variable Depth Sonar (Acoustic, Magnetic, Seismic). Develop and demonstrate a towed sonar system to reliably detect and classify small, very-quiet, slow-moving submarines in the shallow water littoral warfare environment to provide the surface ship platform with a critically needed shallow water warfighting capability. A broadband sonar with large time-bandwidth products (~ 10,000) and good spatial (~0.3 m) and doppler (~0.3 m/s) resolution is required to suppress reverberation and channel fading effects that dominate shallow water active acoustic returns. A variable depth sonar is required to match the signal to the sound channel occupied by the target while reducing surface reverberation (>10 dB) and damping projector motion. A lightweight (<1,500 kg) tow body is required for tactical handling considerations at sea. Transducer material development and selection will be completed by 1997. Sea trials to evaluate system issues and collect broad-bandwidth data will be conducted in 1997, 1998 and 1999. The control, transmit, receive and handling subsystems will be designed, fabricated and tested by 2000. System integration, at-sea demonstration and final report will be completed in 2001. This DTO is Navy critical/Navy specific.

Svr/Agency POC:	USD(A&T) POC:	Customers:
Navy/Mr. Ken Dial, ONR 321, (703) 696-0806	John Transue (703) 614-0212	CAPT Robert Murphy, N863E, (703) 695-2352

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	10.0	13.7	16.7	14.0	14.3	9.0

SE.15.01.ANE Sensor Signal Processing Technology (Acoustic, Magnetic, Seismic). Develops and demonstrates innovative, real-time, adaptive signal processing algorithms and techniques to detect, classify, localize, and engage threats in the littorals, open ocean, and land battlespace. Active algorithms and techniques will improve clutter reduction and reduce false alarm rates while improving target detection and correct classification probability. Applications will be made to surface, fixed wing, helicopter, wide area surveillance, and submarine ASW platforms. Validated algorithms will be transitioned to PMO-411 on two year intervals beginning in 1996 and to PMA-299 in 1999. Algorithms for impulsive active classification and false alarm rejection will be transitioned to PMA-264 in 1997. Multi-static techniques are developed to activate Advanced Deployable Systems and other active receivers and to enable ALFS/SQQ-89 interoperability. Products are planned to transition to PD-80 and PMA-299/PMO-411. Automation techniques are developed to reduce operator loading and to reduce manning requirements. Passive algorithms and techniques will exploit the full spectrum of available acoustic signals by employing non-linear processes and incorporating propagation models into the processing string for application to the submarine, surface ship, fixed wing, and wide area surveillance ASW communities. Battlefield air acoustic efforts will demonstrate real time tracking and identification of ground targets in 1996, demonstrate a broader range of vehicle identifications in 1997, and demonstrate the ability to track large vehicle formations in 1998. Products are expected to significantly improve ASW performance relative to fielded systems and will transition to PEO USW (ASTO) for application to submarines. Adaptive beamforming and array shape estimation techniques will transition to PMS-425. Air acoustic efforts will transition to the Remote Sentry ATD and the Hunter Sensor Suite ATD portions of the Rapid Force Deployment Initiative. This DTO is predominately Navy specific and is Navy critical.

Svr/Agency POC:
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Army/Mr. John Eicke, ARL, (301) 394-2620

USD(A&T) POC:
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(703) 614-0212

Customers:
Mr. Tampa, PMA-264, (703) 604-2200,
CAPT Cable, PMA-299, (703) 604-2700,
CAPT Nifontoff, PMO-411, (703) 604-5064,
CAPT Jeriback, PMO-425, (703) 602-1299,
CAPT Hatcher, PD-80, (703) 602-4869,
CDR Polcari, PEO USW, (703) 602-8530

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	82.6	62.6	74.3	78.4	81.1	78.7

SE.16.01.NE Active/Passive Sensor Technology (Acoustic, Magnetic, Seismic). Develops and demonstrates sensors, sources, and arrays for towed, hull, dipped, floating, and deployed applications in the undersea battlespace. Active transducers will be developed to provide broader frequency bandwidths, lower frequencies, smaller weights and volumes, and higher source levels for application to diverse platforms. High energy density transduction materials such as the electrostrictive lead magnesium niobate (PMN) and the magnetostrictive Terfenol will be developed to reduce transducer size/weight while increasing source levels and bandwidth. Material scale-up, transducer, and impulsive source tests will be conducted in 1997. Battery powered, deployed sources to activate distributed sensor fields will be tested in 2000. Efforts will transition to LFA SURTASS (SPAWAR PD-80), LBVDS (PEO USW PMO-411), LELFAS (PEO AIR PMA-264 and NAVSEA), AEER (PEO AIR PMA-264), and ALFS (PEO AIR PMA-299). Passive acoustic, magnetic and seismic sensors will be developed for larger passive aperture arrays, volumetric arrays and rapidly deployable systems to provide higher array gains. Magnetic sensors will be improved to provide longer detection ranges for fixed wing applications. Fiber optics and associated laser, coupler and splitter technology will be leveraged from the commercial sector and adapted to Navy applications to demonstrate lower cost towed arrays in 1998 and to demonstrate ultra light, long life deployable arrays in 1999. Wider band magnetic sensors will be tested in 1998. Efforts will transition to BQQ-5, BSY-1, and BSY-2 (NAVSEA PMS-425), NSSN (PEO USW PMO-401), DMAD (PEO AIR PMA-264), ADS (SPAWAR PD-80), and SQQ-89. This DTO is Navy Critical and Navy Specific.

Svr/Agency POC:
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CAPT Larrie Cable, PMA-299,
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CAPT Gerald Nifontoff, PMO-411,
(703) 604-5064;
CAPT John Jarabak, PMS-425,
(703) 602-1299;
CAPT William Hatcher, PD-80,
(703) 602-4869;
CDR John Polcari, PEO USW ASTO,
(703) 602-8530

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	31.3	34.3	48.8	50.5	60.4	63.8

SE.17.01.ANFEC ATR Dominant Target ID. A key element of Battlespace Awareness is the capability to recognize targets on land, sea, or air. This technology is critical to the ability to find, identify, and neutralize targets in adverse conditions such as weather, obscurants, jamming, denial, and deception. It reduces operator workload, provides real-time situational awareness, and enables rapid sensor to shooter handoff. This capability is needed for both ISR and Weapon Delivery systems. This is the primary DTO transitioning the product oriented ATR technologies—algorithms and embedded processors—to demonstrate aided/automatic cueing and recognition of aerospaceborne and surface targets on ISR (Intelligence, Surveillance, and Reconnaissance) and Attack platforms. Single and multi-sensor systems including advanced thermal sensors, multifunction laser systems, and multifunction radars are utilized for recognizing both stationary and moving targets. By FY96; Initial Lab Demo SAIP (SAR Image Exploitation), UGV Demo of Multi-sensor ATR; FY97 Tier 3-/U2R SAIP CONUS Demonstration; By FY98; SAIP OCONUS Transition of Stationary Target Recognition Capability, JSTARS demo of Moving and Stationary Target ATR, Airborne Demo of Data Compression on U2R, NRT Lab Demo of ATR of 20 ground targets with multiple configurations & partial obscuration; By FY99; Demo of Moving Target ATR using Tier 2+, By FY00; Sensor to Shooter Demo, by FY01; Comanche Aided FLIR ATR Demonstrated The ATR Metrics are: Isolated Stationary Ground Target Cueing with Pd=.9 at .01 FA/KM2, Force Structure Recognition by Maneuver Battalion Detection with Pd=.9 at .001 FA/KM2, 35 Class Problem Aircraft ID, Discriminate Crude Decoys, Sensor to Shooter Cycle Time Consistent with Precision Strike. Transitions to JointSTARS; P3,S3; U2R; Tier 2,2+,3-; F14, F15, F16, F18, F22; Apache, Comanche; AWACS; Abrams, Bradley; MSX, THAAD.

Svr/Agency POC:	USD(A&T) POC:	Customers:
Carolyn Nash	Susan Turnbach	Mounted BL,
SARD-TT	DDR&E	EELS BL, D&SA BL,
DSN 227-8433	(703) 695-0005	Dismounted BL

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	73.5	108.1	110.2	89.5	68.6	59.9

SE.18.02.NFE Integrated Platform Avionics Demonstration. Demonstrate low cost solutions for future Tri-Service retrofit and forward-fit applications in integrated avionics by utilizing Tri-Service Development Products in a series of testbed demonstrations. Areas of concern encompass system architecture, multi-function apertures, integrated RF and EO subsystems, core signal and data processing, vehicle management system, weapon stores management, power generation and environmental control systems. Tri-Service transition vehicles would be JAST variants, NF-22, and current operational aircraft upgrades, both fixed wing and rotocraft (F-16, F-15, F-117, CH-47, UH-60, AH64). The objective is to lower entire life cycle cost by attacking all aspects of the system acquisition process and many cost inducing factors (weight, volume, power, reliability, performance and mission capabilities). FY96-98 will develop technology applications such as RF photonics, fiber optic networks, Integrated Sensor Systems and digital IF processors. FY99-00 will produce "stairstep" demonstrations of system capability threads. Technology goals for the 2000 time period include 30% reduction in avionics suite cost, reduced weight/volume/prime power by 30%. FY01 will integrate the full avionics testbed. The Tri-Service testbed will allow timely integration of current enabling technologies and provide opportunities for Tri-Service access, common interface and joint utilization of products.

Svr/Agency POC:	USD(A&T) POC:	Customers:
AF: Lt Col John Haynes 703-602-9200 xt24 Navy: Chuck Caposel/NAVAIR 703-604-6240 xt2864	Dr. Don Dix 703-695-4885	JAST Variants, NF-22, CH-47, F-15, F-16, F-117, C-17

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	40.2	23.7	35.0	34.1	38.1	50.5

SE.19.01.NF Compact High Power RF Transmitters. Develop compact, light weight, highly efficient microwave and millimeter wave solid state and vacuum electronic transmitter building blocks for use in high performance EW, radar, and communications systems. Develop novel GaAs-based and InP-based compound semiconductor devices that overcome barriers to meeting operating frequency requirements, operate at temperature levels that provide increased reliability, and have increased fabrication density resulting in reduced cost per function. Combine a solid state monolithic integrated circuit driver amplifier, a vacuum power booster, and an integrated electronic power conditioner into a compact microwave power module (MPM) transmitter. The scope of work to be carried out to provide high power vacuum electronic and solid state transmitters includes development of advanced millimeter wave devices and monolithic format integrated circuits, broadband, high efficiency microwave transmitters, and development and implementation of advanced design and simulation techniques to reduce module and system non recurring engineering (NRE) costs. Develop RF devices for high power and/or high temperature applications from wide bandgap materials such as SiC, GaN, and AlN, to meet military systems requirements. Special material growth processes must be developed and employed to meet performance objectives. In FY97, complete development of a 50 watt output power, 18-40 GHz power module for compact EW transmitters; demonstrate a >20 watt, >40% efficient solid state power amplifier for SHF SATCOM systems; develop ZnO substrates for near-lattice-matched (Al, Ga)N films for advanced power devices; and demonstrate 15 watt 6 GHz SiC MESFET power transistors for advanced RF sensors to provide reliable high temperature operation. In FY98, develop higher quality, lower cost semi-insulating InP substrates for millimeter wave sensors; make available GaN substrates for growth of superior (Al,Ga)N films used in advanced RF power devices; complete development of MPM EW arrays and reduce their fabrication cost by 2X; increase millimeter wave solid state amplifier output power by a factor of 2x for radar and communications systems. This DTO supports F-22 radar and EW, GBR, GEN-X, CEC, MILSTAR, SCAMP, LONGBOW, BCIS, SADARM, STAFF, BAT, and AEGIS SPY -1D UPGRADE, ALQ-131 and ALQ-136. The following Joint War Fighter Operational Needs/Capabilities are supported: Dominant Battlespace Knowledge, Information Warfare, Precision Force, Combat Identification, Electronic Warfare, Joint Theater Missile Defense, Military Operations in Urban Terrain, Joint Countermine, and Joint Readiness.

Svr/Agency POC:
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Air Force: AFMC/STC Richard Davis
Army: SARD Fenner Milton
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Customers:
Navy/NAVSEA;
Air Force/ACC
Richard Neff & SPC Lt.Col. Doug Owens;
Army/CECOM
Robert Giordano

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	8.8	9.4	9.9	5.8	5.6	5.2

SE.20.01.AFE Affordable Multi-Chip Modules for Phased Array Antennas. Develop advanced high density microwave and millimeter wave packaging and interconnect technologies for shallow depth/conformal phased array antennas used in radar, EW, smart weapons, and communications applications. In FY97, develop tile-type modules that have a 5:1 weight reduction and a 10:1 cost reduction over conventional module technologies. In FY98, use the tile modules to develop array technologies that will have a 5:1 volume reduction, 10:1 cost reduction and a 2.5:1 weight reduction. A millimeter wave thrust includes development of integrated tranceivers for smart weapons.

Svr/Agency POC:	USD(A&T) POC:	Customers:
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Carolyn Nash SARD-TT DSN 227-8433		

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	3.3	3.3	3.7	3.6	3.7	3.2

SE.21.01.AFE Low Power Consumption RF Electronics. Develop affordable, low power consumption RF electronics for military man-portable communications and for airborne and space-based platforms that are volume and weight starved. The scope of work encompasses design, fabrication and simulation of device structures and materials for high power-added efficiency, miniaturized low loss filters, and circulators, ultrastable frequency control oscillators and clocks, enhanced component thermal management technologies, and mixed mode integrated circuits. In FY97, develop RF low power consumption GaAs RF ICs for advanced receivers. In FY98, develop communications and radar subsystems demonstrations illustrating the approach being taken to achieve a 5X reduction in power consumption and conduct demonstrations of miniature digital receivers aimed at increasing performance at a reduced cost, size and weight for radar/EW multi-function systems. This DTO supports F-22 radar and EW, GBR, GEN-X, CEC, MILSTAR, SCAMP, LONGBOW, BCIS, SADARM, STAFF, and BAT. The following Joint War Fighter Operational Needs/Capabilities are supported: Dominant Battlespace Knowledge, Information Warfare, Precision Force, Combat Identification, Electronic Warfare, Joint Theater Missile Defense, Military Operations in Urban Terrain, Joint Countermine, and Joint Readiness.

Svr/Agency POC:	USD(A&T) POC:	Customers:
Navy: ONR Ingham Mack Air Force: AFMC/ST STC Richard Davis Army: SARD Fenner Milton DARPA: L. Glasser	Susan Turnbach DDR&E (703) 695-0005	Navy/NAVAIR, Air Force/ACC Richard Neff & SPC Lt.Col. Doug Owens, Army/CECOM Robert Giordano

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	14.3	28.4	38.7	31.7	29.4	23.1

SE.22.01.ANFE Advanced IRFPA. DoD platforms have achieved superior reconnaissance, surveillance, tracking, and acquisition (RSTA) functions through the use of optical sensors with much of these achievements coming from focal plane sensors (i.e. Infrared Focal Plane Arrays (IRFPA)). Obstacles remain in developing truly autonomous and reliable RSTA functions because of limitations in range, detection in clutter, and false alarm rates. Advanced focal plane array technologies can be used to construct high performance multi-spectral sensors integrating both sensors and electronics in the same package, thereby greatly improving the range, sensitivity and performance of the optical sensor packages. Application of commercially compatible manufacturing techniques is expected to make affordable production of these sensors feasible. Spectral regions include UV, visible/NIR, MWIR, LWIR, VLWIR and MM wave in active or passive modes of operation and will include polarization effects.

A very long Wavelength IR (> 12mm) FPA employing an InGaAs/GaSb superlattice system and two color sensors is planned by FY98, enabling detection of quiescent man-made objects in deep space, an important new capability . Integration of on-chip signal processing with multi-spectral sensing components will demonstrate, by FY99, a detection range increase of 2x for cluttered scenes with acceptable false alarm rates and at a cost that is less than half of comparable multi-sensor approaches. Using three band IR FPAs and automated manufacturing, an automatic foveal search and targeting system will achieve a 10x increase in target detection capability for situational awareness by FY00. By employing active/passive 3D imaging with common aperture sensors, an improvement of up to 20x detection in clutter will be demonstrated by FY01. Integration of MM wave and IR sensors and processing on-chip will enhance detection of LO targets in clutter by FY02.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	39.6	34.3	19.5	24.7	9.9	8.9

SE.23.01.E Militarized Flat Panel Display Technology. Develop affordable and manufacturable displays for use military use and in particular for man portable applications. These flat panel displays must meet military unique needs that are not currently being addressed by commercial sources including operation under rugged conditions and extended temperature ranges, as well as the need to be legible in sunlight. Of particular importance is the miniature display thrust which will enable for the first time true heads up displays for helmets and cockpits, weapons sights and future soldier systems. Blue & white phosphors with brightness adequate for production displays will enable flat panel displays that should reduce power consumption by 4x in display systems and reduce weight and volume by 5x by FY96. Develop (1)low voltage and high luminous efficiency materials to reduce power requirements by 10x with current display addressing requirements by FY97, and (2) lightweight (10x size and weight decrease over flat panel), low power, high definition (2000x2000 element), full color miniature(i.e.1”x1”) displays by the end of FY00.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	85.5	50.9	57.3	56.1	56.7	59.0

SE.24.01.ANFE Optical Control of Radar, Comm. and Electronic Warfare Systems. Develop technology to control RF and microwave signals using fiber optic links for radar, communication and electronic warfare systems and achieve performance improvements due to better bandwidth capability as well as cost savings due to lighter, smaller, less complex and demanding assemblies. This approach can be applied to phased array radars and communications systems, automatic target recognition, electronic warfare and high-speed networks to achieve communication rates 10x-100x beyond of conventional electronic communication. Develop components for the optical control of phased array radars (including optical transceiver chips for high speed interconnection in noisy environments) and demonstrate that 100x weight saving in interconnection assemblies over electrical waveguide approaches can be achieved by FY98.

Develop fiber optic links for RF and microwave antenna remoting and optical control of phased arrays that can demonstrate a 10x enhanced system performance within current platform size, weight, power consumption and volume constraints by FY99. Demonstrate in FY05 an optical beamforming phased array radar employing opto-microwave integrated circuits (OMICs) and fiber optic links that has a 100x reduced weight and size and supports true time-delay and allows broadband RF beamsteering without "squint"(which is not possible with current systems).

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	16.6	27.4	39.9	56.7	56.5	60.7

SE.25.01.NFE High Performance Microelectronics for Signal Processing and Computing. Develop devices and circuits to enable information dominance of the battlefield and provide survivable systems for information warfare defense. These technologies must provide superior performance (over commercially available products) for key military applications in high speed computing, signal conversion, and processing while extending density and reducing power dissipation. Leverage commercially available technology and develop novel silicon-based and III-V compound semiconductor devices that overcome barriers to the operating speed, the operating temperature and fabrication density. Develop memories with a 20x increase in speed-power performance by FY97, a family of analog to digital converters ranging from 4 bits at 20 Gsps to 20 bits at 20 Msps by FY99, improved neural network with 100K synapses with large fanout (>1000) and improved linearity and resolution (> 60 dB SFDR) by FY98, a medium scale integration SiC process that can produce circuits capable of operating up to 500oC by FY98, and extremely dense devices and circuits able to operate at high speed but consuming less then 0.1mW/gate-MHz by 2001 (200X improvement in power dissipation). Programs that are expected to directly employ these technologies are the F-22, Commanche, JAST with higher performance density circuits, AEGIS SPY 1-D, F-16 APG/68 upgrade, E2C AEW, F-22 and JAST with conversion circuits, and Commanche with neural networks]

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	60.6	34.9	27.5	33.1	44.9	48.3

SE.26.01.AFH Radiation Resistant Microelectronics. High performance and extremely dense radiation resistant microelectronics are crucial to achieving dominant battlespace knowledge and joint theater missile defense objectives. A major objective is to provide space and strategic systems with timely access to affordable state-of-the-art radiation resistant microelectronics, which increasingly involves leveraging commercially available microelectronics technology. Space applications which dominate current requirement for radiation resistant microelectronics demand significant reductions in weight, size and power while simultaneously increasing performance. Technical barriers include; achieving radiation survivability in high-performance, low-power, deep submicron (<0.35 μm) feature size microelectronics; reducing the cost; and delay in radiation hardening through the use of modeling and simulation, ad significantly increasing the density of electronic systems. Development of a submicron radiation resistant microelectronics fabrication process will produce a 16 fold increase in density and enable the demonstration of power converters with 95% efficiency, a radiation resistant 4 Mb static memory and a 32 bit data processor in FY98. Increasing performance by 100x, density by 10x and reducing power dissipation by 50x will be achieved using a radiation resistant deep submicron fabrication process demonstrating a radiation resistant 1000K gate array, 64 bit advanced microprocessor, 16 Mb static memory and a 12-16 bit, 40-100 Msps analog to digital converter by FY01. Customers for radiation resistant microelectronics include strategic missiles and satellites such as EKV, SMTS, GPS, MILSTAR, UHF follow-on, SBIRS, DSP, and NPOESS.

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Maj. J. Wicklund,
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Mr. Cullen, USSPACECOM
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Ms. K. Basany, USAF SMC/MT
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310-363-0217

Capt. B. Figgie, BMDO/TRS,
703-695-8841

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	12.0	13.4	12.2	11.2	10.0	6.6

SE.27.01.E Microelectromechanical Systems. Develop advanced MEMS technology to significantly increase the capabilities of weapon platforms and information systems, while simultaneously decreasing their size, weight, cost and assembly complexity. Develop reliable repeatable fabrication techniques for microscale integrated electrical and mechanical systems. Demonstrate integration techniques for microscale sensors integrating thousands of transistors and 10-20 mechanical components on the same chip in FY96 and then use these techniques to develop an integrated inertial guidance system on a chip in FY97. Overcome fabrication, materials and physical barriers to develop highly integrated nanometer-feature-size microsystems that integrate sensors, processing circuits, and I/O (actuators, displays), produced by affordable, flexible fabrication techniques by FY01. Demonstrate a detailed model of aircraft flight under control of multiple (>10,000) distributed and embedded MEMS sensors, actuators, and processing elements in FY01. Positioning systems and inertial guidance systems are key applications areas, with the GPS program already employing MEMs, and it is expected that many future smart munitions will use MEMs for inertial guidance. Other applications include sensor and actuator systems for smart munitions, inertial guidance, chemical/biological agent detection, and for conformal surface control of aircraft structural elements.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	30.1	56.8	65.1	66.6	24.3	0

SE.28.01.FE Integrated Design Environment Technology. Demonstrate, by FY97, via an integrated design environment, virtual prototyping, and design reuse, a 4X improvement in the quality, acquisition cost, design cycle time, and life cycle cost for new digital signal processing systems and system retrofits. Demonstrate, in FY98, an upgrade to the AN/UYS2a-based Sonar Signal Processor with a 15X processing throughput improvement, to execute Echo Tracking Classifier (ETC) algorithms in real time for enhanced object detection in shallow water. New design technology will allow reduction of hardware from 13 printed circuit boards to 3, with minimal impact on existing software. The processor will be flight-tested in the ALFS`07 on the SH-60 helicopter. The Rapid Prototyping of Application Specific Signal Processors (RASSP) methods and tools will be transitioned commercially through major domestic CAD vendors starting in FY96. Beyond FY00, CAE technology will address the full integration of analog, digital, optical and microwave/millimeter wave circuits and yield an additional 50% reduction in integrated models cost.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	1.3	6.4	12.4	14.3	15.6	17.0

SE.29.01.FE Electronic Module Packaging and Interconnect Technology. The growing need for increased functionality in mobile military systems requires the use of modern integrated circuits with advanced multi-chip module (MCM) packaging and interconnection technologies. Significant military capabilities such as smart weapons, wireless communications, covert tags, individual soldier computers, navigation aides and tactical information assistants will be enabled using affordable MCM capabilities. Since military assemblies are often required to operate over a wide temperature range, meet stringent size, weight and power requirements, while remaining affordable, this DTO will focus on the research and development of technologies to design, fabricate, assemble and test high-density, electronic modules (including digital, analog, electromechanical, and optical components) that are suitable for small-quantity military system applications. In FY98, the ability to design MCMs in 1 month, at a tenth of the current cost, will be demonstrated. By FY00, scaleable manufacturing capabilities for mixed-signal MCMs, operating at 1 GHz clock rates, will be demonstrated.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	69.7	45.6	66.1	95.1	113.2	140.2

SE.30.01.ANFE Energy Storage and Distribution Technology. Provide, by FY98, at least 50-100% increased energy density for both primary and rechargeable batteries. This advance in battery energy density will enable corresponding reductions in portable energy source size and weight, and support increased demands for man-portable electronics contributing to the military's ability to project mobile forces and execute longer missions. Delivery of next-generation primary batteries for the 21st century Land Warrior Field demonstration (Soldier-System Command) are planned for FY96 and FY98. Power distribution on shipboard, airborne and vehicular platforms currently relies on diverse approaches, mostly reliant on military unique power components. Improvements in distribution efficiency of 10X in power density, and 3-5X in reliability and switching speed, are planned for year FY00. These improvements, along with digitally controlled common power elements, are expected to reduce power distribution costs to one-tenth of current approaches. Flexible digitally controlled building blocks should simplify large and complex power distribution problems on military platforms. Further, 3-5 fold gain in power density will be realized beyond year FY00 by utilizing wide-band gap materials for Power Electronic Building Blocks (PEBBs.)

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	16.9	10.0	8.7	12.3	13.2	15.6

SE.31.01.A Advanced Optics and Display Applications. Develop and demonstrate a family of core optics and sensor display technologies for future head-mounted high resolution display/sensor systems (HRDS). By FY96, select and develop state-of-the-art optics (defractive, aspheric, hybrids, etc.) sensors (CCD or Image Intensified DDC), and display (AMEL, FED, FLCD, etc.) technologies for integration into high performance, low weight/cg head-mounted vision systems. Utilize concurrent development of sensor read-out and display drive electronic architectures for power/bandwidth optimization. By FY97, develop laboratory concept demonstrator for integrated high resolution, 60º FOV, low power HRDS suitable for infantry use, with cross platform (Armor/Aviation) horizontal technology applicability. By FY98, complete fabrication of two (2) units using increased performance HRDS components for parallel demonstration with 21 CLW (Gen II Soldier) Integrated Helmet System.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	3.2	3.3	3.3	0	0	0

SE.32.01.ANE Warfare Support in Littoral Battlespace. Building upon a strong base of completed and on-going research in the open and coastal ocean, this initiative will develop and demonstrate selected capabilities to acquire and exploit meteorological and oceanographic battlespace environmental information for the current and predicted status of expeditionary, mine warfare, and anti-submarine warfare (ASW) (underwater acoustic) systems and scenarios. A significant aspect of the program is the application of such capabilities to Joint Logistics Over The Shore (JLOTS). Recent experience in JLOTS has demonstrated that accurate surface wave predictions require detailed wind conditions, bathymetry, and current conditions (FY96). Components of this initiative include: the exploitation of the existing AEGIS system to provide NEXRAD-like doppler radar weather monitoring and measurement to 150 nmi excess (FY97); demonstration of a finite element model for coastal application/complete global hindcast climatologies for JLOTS applications (FY97); demonstration of an integrated Autonomous Ocean Sampling Network of oceanographic measurement nodes for high-resolution spatial and temporal characterization of a regional littoral under-ocean environment (FY98); generation of a prototype On-Scene Analysis and Forecast System capable of regional battlespace environment prediction, from inputs of current meteorological and oceanographic conditions and use of developed coupled atmospheric and oceanographic models (FY99); demonstration of an integrated wave, water level, currents, and sediment model for coastal areas (FY99); extension of the acoustic-based ASW capability in shallow water in specific environments (Yellow Sea, Persian Gulf, Mediterranean Sea, Red Sea, Baltic Sea) by a factor of 2 to 5 by using coupled air-ocean environmental predictions for acoustic propagation conditions (FY99); extension the ASW performance prediction to all littoral areas with a relocatable prediction model that can be executed in real-time with minimal advance notice (FY01); and an expansion of our knowledge base and understanding of the physical conditions and variables that affect the performance of sensors and operating systems for expeditionary, mine warfare, and ASW, including quantitative measures of environmental influences in all these topics. In particular, these components include research efforts on the development of an integrated model for the effects of suspended atmospheric particulates (aerosols, in cooperation with the Lower Atmosphere topical area) upon the performance of electromagnetic and optical sensors used for sea mine hunting and coastal ship defense (FY98); the derivation of "auto-focusing" algorithms to correct for mine-hunting synthetic aperture sonar phase perturbations produced by spacial variabilities of sound speed in water (FY97); the development of improved predictions of wave dynamics which can affect the performance of undersea pressure and acoustic influence mines, as well as the operating dynamics in an amphibious operating area (FY00); and the demonstration of a 3-D turbulence model for localized sediment scour to support JLOTS (FY00).

Svr/Agency POC:	USD(AT) POC:	Customers:
M. Briscoe, ONR DSN 226-4120	Capt. Smith ODDR&E (703) 695-9604	Fleet Numerical Meteorology and Oceanography Command (FNMOC), CAPT R.J. Plante, DSN 878-432,7 and Naval Oceanography Office (NAVOCEANO), Dr. Andy Johnson, DSN 485-4403

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	12.1	16.1	18.0	18.4	6.9	6.9

SE.33.01.ANF Combat Weather Support. Demonstrate by FY97, new capabilities to incorporate battlefield weather observations from different sources/times into analysis fields for data limited battle areas on land and at sea. Participate in operational test exerciser such as FOAL EAGLE and Advanced Warfighting Experiment (AWE). This will improve 48 hour target weather forecast accuracy by 20%. Deliver by FY98, an artificial intelligence 1 to 12 hour forecast model "first-in" capability for communication-denied battle areas. This will improve target weather forecast accuracy at 12 hours by 40% over currently used climatology. Deliver distributed shipboard and battlefield weather prediction systems FY00.

This improved analysis and forecast capability satisfies the joint needs of the services of battlespace (mesoscale) weather support to combat operations. As such, it supports Precision Force through improved Joint Force decisions concerning the best times to neutralize enemy targets under specific weather conditions. For example, a recent DoD study showed that a 10% forecast improvement would lead to a 15% increase in Probability of Kill (Pk) accuracy calculation resulting in a huge cost savings from better smart weapons utilization. By FY00, deliver compregensive, distributed shipboard and battlefield weather prediction systems. These products will be tranistioned through a joint tactical weather system.

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US Army through Air Force Director of Weather.

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	4.7	4.4	4.4	4.4	3.4	3.5

SE.34.01.A Smoke, Obscurants, and Camouflage. The need exists to conceal friendly force assets from threat sensors, and for sensors to acquire enemy low observable (LO) targets. Signature management systems provide mobile and semi-mobile assets (e.g., Abrams, Theater Missile Defense -TMD) with low cost, low burden survivability enhancements addressing detection avoidance and hit avoidance in global battlefield conditions. Low Observable Simulation (LOSIM) will provide a capability to evaluate operational effectiveness of sensors and LO targets against one another and provide the input data to realistically portray LO and deception wargame simulations. Obscurant materials will block or defeat enemy RSTA assets in the millimeter wave region of the electromagnetic spectrum. By FY97, demonstrate a millimeter wave screening material that degrades to non-harmful residues after completing its intended mission. By FY99, develop reactive IR suppressive coatings to reduce vehicle and solar loading signature over an extended period of a 24 hour cycle and varying background. By FY99, demonstrate LOSIM non-real-time simulation capability for scene generation and target assessment to determine LO requirements and effectiveness. Demonstrate feasibility for inserting real-time multiple sensor simulation of LO target effects into wargame simulations. By FY00, develop a hybrid passive/reactive signature management system to reduce the detection range of moving vehicle by 50% and an active/passive camouflage screen that significantly reduces the signature of general purpose platforms. By FY02, develop a fully active multi-spectral signature management and deception system, operating in the radar, infrared, and visual spectrums, for combat vehicles.

Svr/Agency POC:	USD(AT) POC:	Customers:
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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	1.0	1.0	1.0	0	0	0

SE.35.01.ANF Electro-Magnetic & EO Propagation in Lower Atmosphere. The objective of this program is to develop and validate the models which translate the measured or forecasted state of the atmosphere into terms that define the state of the atmosphere on specific systems and operations. All battlefield activities require sensors that operate in or through the lower atmosphere: Communication systems, weapons systems, reconnaissance systems, etc. A common requirement for all of these systems is a knowledge of the propagation characteristics at the required wavelengths. The spectral range of interest extends from the visible through the infrared to the microwave region. This objective will be met through joint Service developments of atmospheric propagation models and comprehensive decision aids incorporating the propagation models into a complete description of targets, backgrounds, atmospheric propagation and system characteristics. Specific developments include, by FY98, complete development of refractivity model in support of communications in the littoral region. This model will be transitioned for shipboard C4I applications and is expected to provide a 20% improvement in the prediction of communication outages. By FY98, transition to DMSO, a capability to ingest climatological statistics from satellite observations directly into DoD standard transmission models. This will provide a world-wide capability to specify the propagation state of the atmosphere in real-time. By FY99, transition tactical targeting EO simulator to AF Mission Planning Systems. This development includes the capability to specify detailed scenes according to the spectral response of the weapon system. By FY99, develop and validate propagation and background models including the high resolution effects of smoke, camouflage, concealment, deception and low observables. This capability will be developed for urban and complex terrain and will improve target acquisition by 50%. By FY01, demonstrate a capability of satellite remote sensing of the battlespace environment and its tactical application in operational decision aids. This capability is expected to revolutionize mission planning.

These products will be transitioned to AWS (AF), CECOM and STRICOM (Army), and USN Fleet (Navy).

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	4.4	4.5	4.7	5.0	5.3	5.4

SE.36.01. F Specification of the C3I Battlespace Environment. The efficient and unrestricted flow of information between all levels of Command is critical to the success of every military operation. The ionosphere, that region of the earth's upper atmosphere that supports or hinders the propagation of electromagnetic signals must be factored into the design and operation of military C3I Systems. Direct support to Commander in the field (via JCS) during Desert Storm was key to strategic planning and important to engineering support costs. Ongoing support in present areas of conflict is now integrated into mission planning, to minimize surprise loss of access to GPS and C3I space assets. A 95% increase in specifying global ionospheric disturbances (scintillation) conditions by FY07 will result in a commensurate decrease in the number of times warfighting units will unexpectedly suffer C3I outages and a 66% decrease in the time (and costs) associated with anomaly resolution. Improving the reliability of specifying global ionospheric disturbance (scintillation) conditions by a factor of five, by FY98, will provide a ten-times decrease in the number of times the warfighter will suffer surprise losses of C3 system operational capabilities, including GPS, and will reduce by a factor of three the time/cost of determining the cause of C3I system interruptions/degradations. By FY02, with the availability of space and ground-based sensor data to drive physical models of the battlespace environment, the technology will be available to provide the capability for prompt, accurate, specifications and forecasts of the battlespace environment and its impact on C3I systems, anywhere in the world.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.5	2.4	2.2	2.2	2.2	2.3

H. DEFENSE TECHNOLOGY OBJECTIVES FOR SPACE PLATFORMS

SP0106FC Cryogenic Technologies. Develop advanced cryogenic cooling technologies for space-based surveillance sensors requiring cooling between 10 K to 150 K that offer mass savings, performance improvements, and long life potential over current dewars and radiators. SWIR, MWIR, and LWIR detectors require cryocooling to reduce the thermal noise; thereby providing higher signal to noise ratio and a greater acquisition range. The technical objectives include: reduce mass by 15% by FY00 and 50% by FY05; reduce specific power (watts of input power divided by watts of cooling) from 40 to 25 by FY05 and reduce it to 15 by FY10; increase life expectancy from current 3 year level to 5 years in FY00 and to 10 years by FY10; improve reliability from 95% to 98% by FY05; and eliminate significant induced vibration by FY10. The technology challenges include: develop lighter weight cryogenic materials; optimize integration; minimize friction and material stresses; eliminate contamination sources; minimize loss mechanisms; and develop vibration isolation techniques. Cryogenic technologies are applicable to sensors for space surveillance and missile warning and tracking missions, specifically the SBIRS program, as well as NASA and NPOESS environmental sensors, and other agencies. The technologies also support super conducting or cooled electronics which will be pervasive to all DoD spacecraft, as well as AFSPC, NASA, and other agencies programs.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	4.8	12.6	12.5	13.5	13.6	7.6

SP0207F Thermal Management Technology. Develop technologies to improve the performance and reliability while reducing the mass of spacecraft thermal management subsystems. These technologies include: heat pipes, thermal energy storage devices, thermal transfer devices, and radiators. The goals of these technology developments are: increase heat flux from 10 W/cm2 (current) to 100 W/cm2 by FY10; increase heat transport by 25% by FY00 (75% by FY05, 120% by FY10); decrease thermal subsystem mass by 5% by FY00 (15% by FY05, 30% by FY10); decrease electronic component temperature by 10°C by FY00; and decrease spacecraft heater power by up to 75% by FY05. Technology challenges include: rapid, reliable start-up and long term operation of capillary pumped loop systems and liquid metal heat pipes; and development of (1) low cost, advanced composite materials and devices capable of dissipating high heat fluxes from microelectronic devices, (2) sub-micron wicks (1 micron pore size) for capillary pumped loop applications, and (3) flexible or rotatable joints that allow for the efficient transportation of heat from the spacecraft bus outboard to a deployable radiator. Thermal management is considered a pervasive technology area, applicable to all DoD, NASA, and commercial spacecraft program offices as well as AFSPC, and other agencies. The technologies are essential for those missions with either high power dissipation (SMC or SAF/SP space based radar for surveillance/mapping) or concentrated power dissipation on reduced area payloads (next generation military and commercial communication spacecraft such as MILSTAR III, as well as the NPOESS program with a multitude of weather sensors).

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.6	3.3	3.4	2.4	2.6	2.6

SP0306NF Space Structures and Control. Develop advanced space structural component technology to reduce the weight and cost of spacecraft and launch vehicle structures while improving their producibility and reliability. Also develop enabling structural sensing, control and vibration damping technologies for space platforms, precision surveillance sensors, space based radars, space based interceptors, missiles, and launch systems. This includes the development of a new class of adaptive or smart structures, which contain sensors and actuators to sense and suppress vibrations to meet mission requirements, the development of new mechanism concepts, such as non-pyrotechnic release devices, and new structural response sensors, such as advanced, multiplexable fiber optics sensors based on Bragg technology. In addition, there is exploratory research into the development of new structural control algorithms and into new approaches for determining the structural response characteristics of a space system on orbit. Specifically, develop and demonstrate advanced structural control technology concepts, techniques and production approaches to: reduce satellite structural mass by 40% and reduce cost by more than 10% by FY01 (75% and 25% respectively by FY11); to reduce launch vehicle structural subsystem mass by 40% and cost by 25% by FY01 (75% and a factor of 10, respectively, by FY11); decrease satellite dynamic launch loads by a factor of 5 by FY01 (a factor of 20 by FY11); reduce satellite pyrotechnic-shock by more than two orders of magnitude by FY01; demonstrate flight qualified fiber optic sensors by FY00; and decrease on-orbit disturbances experienced by payloads by a factor of 10 by FY01 (a factor of 100 by FY11). Technical challenges/barriers include: rapid and less costly manufacturing techniques for large launch vehicle structures; accounting for the synergistic effects of the combined aspects of the space environment; developing high fidelity simulations; reducing the EMI effects and increasing the reliability/durability of Multi-Functional Structures; satellite structural isolation without constraints on rattle space (clearance), weight, power, and volume, as well as interaction between the isolator control system and the launch vehicle control system; rapid non-pyrotechnic release mechanisms; and integration of neural network technology into structural control systems during its operation. The technical approaches are: new structural concepts and construction methods to decrease the weight and cost, as well as improving the conductivity and radiation shielding capability of, satellite bus and secondary structures; new techniques to better understand and predict the effects of the space environment on spacecraft structures; and integrating power, communication, and electrical paths into the structure thus eliminating the need for wiring harnesses, connectors, and electronic boxes (Multi-Functional Structures). Structural control and vibration damping technologies are pervasive and support a wide range of commercial and military customers including all DoD spacecraft program offices as well as AFSPC, NAVSPAWARS, NASA, and other agencies.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	7.2	7.0	7.8	8.8	10.1	10.9

SP0506F Large Precise Structures. Develop material applications, light weight deployable structures and structural precision alignment technologies to provide stable, high performance from poor quality structures. Applications include surveillance, e.g., ‘space AWACS,’ communications and direct energy weapons, e.g., space based laser (WE0404CF). Current systems are limited not only by the physical size of the spacecraft, but by the quality and alignment of the system after incurring stresses induced by launch and exposure to space environment. On orbit construction of erectible systems with alignment and compensation by adaptive optical systems could provide a four-fold increase in resolution over today’s system. Key technologies to be developed and demonstrated are extremely lightweight, large apertures including dilute and inflatable optical and RF antennas, space erectible structures. Consideration will be given to space apertures using silicon carbine subapertures and inflatable mirrors. Brute force structural alignment and surface quality and configurations can be traded off with wavefront correction of structural imperfections leading to major reductions in overall system weight and consequently lower cost to place in orbit. In 1998, the technologies will be integrated in the New World Vistas initiated Compensated, Large Lightweight Space Optics program, a laboratory evaluation of integrated system performance which will begin in 1998. This program will demonstrate in 2010 the performance of a revolutionary approach to a large aperture, high resolution, space deployable imaging system implementation which will reduce optics payload weight by at least 50% and launch cost proportionally. It will demonstrate space sensor technologies required for very large aperture long dwell systems used for Global Awareness.

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AFSPC/DR, 21st Space Wing
USSPC, and other agencies

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	3.5	3.8	8.0	6.4	9.2	10.5

SP0606NFH Space Systems Survivability. Develop hardware and software techniques required for space systems to survive and operate during flight without performance degradation from the myriad of possible natural and manmade threats. Natural stresses arise from radiation, debris, and chemical activity which can degrade spacecraft electronic and mechanical systems. Beyond addressing the natural rigors of space, additional efforts are also needed to mitigate the various hostile environments that might be created by an adversary. The most pervasive challenge is assuring that spacecraft electronic systems have both total dose and Single Event Effect (SEE) radiation tolerance. Future operations in moderate dose orbits (up to 50 krad total dose over mission life; see SE2601AH DTO for radiation hardening used in high dose orbits) are supported by two Navy projects nearing on-orbit operation. The prime experimental task of the Microelectronics and Photonics Test Bed (MPTB) program is the measurement of radiation effects, both on the ground and in orbit, with concurrent radiation dose and spectra measurements for a number of primarily Commercial Off The Self (COTS) microelectronic and photonic devices and subsystems. The space System Program Offices (SPOs), which provided the prioritization to the MPTB program, will gain a near-term payoff in FY97 with the space qualification of devices with a factor of 10 gain in capability for their space systems. Once the space flight data has been reduced, the program's predictions and models will provide the broader payoff of improved understanding of SEE processes, especially for reduced feature size devices, and the radiation environment with initial availability by FY98. The Advanced Spacecraft Computing and Autonomy Testbed (ASCAT) project will operate an advanced testbed of computers aboard the DoD Space Test Program’s ARGOS spacecraft to: (a) evaluate performance and obtain comparisons among the Harris RH3000, TRW RH32, and Honeywell RH32 processor designs operating in a DMSP type orbit, (b) evaluate fault-tolerant software methodologies, (c) perform fault logging and statistical analysis, (d) and carry out on-orbit processing of sensor inputs for autonomous operations. The payoffs for the ASCAT project will be the technical basis for major satellite programs to select future computer and software designs with system-level radiation tolerance and proven techniques for autonomous operation. Multiple transitions of ASCAT test results to SPOs will begin in Sep 1997 and continue through Sep 2000. Air Force efforts on other natural sources of spacecraft degradation mainly address earth orbiting debris and solar orbiting micrometeoroids. A predictive computer model of the debris environment will become available by FY97 and a more general spacecraft predictive hazard model has an expected release in FY99. Hostile environments include but are not limited to directed/kinetic energy weapons (laser, microwaves, and kinetic projectiles) and collateral nuclear effects. Tasks to address this threat include: threat susceptibility/ vulnerability assessments of critical components, subsystems and systems; development of countermeasures to mitigate vulnerabilities; and demonstration of technology options to support balanced strategies to detect, avoid and operate in threat environments. Current technology efforts involve: development of miniaturized radar and laser detectors for threat warning; sensor jamming protection techniques for critical sensor optical components; front-end RF protection devices; and predictive debris hazard models. These efforts will culminate in a space flight demonstration in FY2000 which will support anticipated satellite block changes for SBIRS, MILSATCOM and GPS. Current typical objectives for operating through a threat are: 10 E-4 SMATH Level 1 for laser; 10 E-4 JCS for enhanced radiation; and the values are subsystem specific for RF. Current typical survival objectives are: 1 SMATH Level 1 for laser; 1 JCS for enhanced radiation; and 140 dbW (EIRP) ground source for RF.

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Customer POC:
Space SPOs, BMDO, DNA, USSPACECOM, NAVSPAWAR, DoD labs, NASA, other agencies, commercial space assets

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	7.5	8.0	7.4	7.4	7.4	7.5

SP0703FE Space-Based Guidance, Navigation, and Control (GN&C). The goal is to develop new or improved GN&C hardware, software and techniques for use in operational systems with a space component. This includes systems employed tactically in the terrestrial environment as well as satellite and missile systems. Navigation techniques fusing GPS data with local sensors and database information is an emerging core for much of the work. There are presently two, albeit disparate, thrusts: (1) precision navigation on, or near, the earth's surface and (2) the more classical space problems of satellite and missile Guidance, Navigation, and Control (GN&C). The precision near-earth navigation problem has a focus on providing the warfighter with a broad accurate digital representation of the operational theater (consistent battlespace understanding). By FY98, the integration of data from GPS, local navigation sensors, and Digital Terrain Database (DTD) source through advanced navigation algorithms should demonstrate 1-3m positioning information. Beyond overcoming the data fusion problem of generating useful information for situation awareness and path guidance, anti-jam/anti-spoof GPS technology to mitigate active ECM, and GPS receiver satellite selection algorithms appropriate cultural/natural terrain shadowing situation are technical challenges. In the longer term, developing a concept that integrates the precision navigation with imaging technology to support robust situation awareness, path guidance, and precision targeting requirements should be completed by FY01. The precision guidance customers include Silo-based ICBM SPO, AFSPC/DR and 20th Air Force. The foci for satellite and missile GN&C are to develop and improve various sensor and system level technologies that (1) increase accuracy and performance while reducing size, weight, and cost for both spacecraft and missile navigation, attitude determination, orbit determination and propagation, and tracking; and (2) improve understanding of nonlinear dynamical behavior and interaction with geomagnetic field and long term orbital dynamics of artificial satellites. Recent tests have shown that orbit determination algorithms under investigation are approximately 400% better than the fielded AFSPC supplied state vector. Specific technology approaches are: (1) develop and improve current accelerometer and gyroscope technology, to include ring laser gyros (RLGs) and interferometric fiber optic gyros (IFOGs), and other solid state devices, performance by a factor of 4 while reducing size, weight, and cost as compared to currently employed systems by FY02; (2) increase GPS aided navigation system accuracy by a factor of 2 (goal 5-10 m absolute positioning), reduce antenna weight and cost by a factor of 2, improve range metrics and tracking while reducing range associated costs by FY04; (3) improve star tracker pointing accuracy by a factor of 5 (goal 1 arcsecond), and decrease star tracker size, power, and weight requirements by _33% by FY04; and (4) develop algorithms, computer software, and associated computer hardware for autonomous navigation that will increase spacecraft navigation accuracy by a factor of 3 (goal 30 m positioning accuracy) and attitude determination data by a factor of 2 (goal <0.01 degrees) by FY04. The corresponding technical barriers are: (1) radiation hardening, light sources, digital processors, coil selection and winding (IFOGs), mechanical dithering and mirror durability (RLGs), gyro material, and micromachining processes; (2)The highly dynamic space and missile environment, radiation exposure, robust software for real-time navigation data, and the effects of plasma; (3) solid state detectors, digital processors, and optical alignment; and (4) laser tracking and accurate ephemeris data. Satellite GN&C customers include, SMC, AFSPC, Strategic Missile System Program Office, ONR, BMDO and others.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	6.6	5.0	4.9	5.0	5.3	5.1

SP0806FCH Space Power Technology. Develop satellite power subsystems that will enable a factor of two improvement for the total power system (8 W/kg at $6000/W) by FY00 and a factor of four improvement (15 W/kg at $4000/W) by FY05 over current system specific power (~4 W/kg at $10000/W). In addition, establish the performance credibility of high temperature, compact power sources by FY05 that should extend the availability of electrical power for DoD satellites by at least a factor of five (into the 50-100 kW range). These increases in system specific power will garner cost savings, increase power, and provide mass saving which contribute to the use of smaller, lower cost launch vehicles at tremendous savings to the government. To achieve these goals, significant technological advancements will be made in the three space power areas: energy generation, energy storage, and power management and distribution (PMAD). In energy generation, typical conversion values for solar cells are nominally 18.5% today with arrays generating useable power at nominally 50 W/kg. By FY00, the objective is to increase the conversion efficiency and specific array power to 28% and 100 W/kg, respectively, by developing higher efficiency photovoltaics, concentrator arrays, and revolutionary solar thermal energy generation devices, as well as mitigating the space environmental interaction effects on these technologies (especially for orbits in the radiation belts). An increase to 35% efficiency and 120 W/kg is planned by FY05. To further extend the range of available electrical power, technologies required for high-temperature, compact power sources will be developed. Technical barriers include: compatibility and applicability of advanced materials in the space environment; viability of manufacturing; and feasibility of solar thermal conversion and limits on high-temperature power conversion efficiencies. In energy storage, technology thrusts are aimed at raising the specific energy at the cell level from nominally 50 Whr/kg (SOA) to 120 Whr/kg by FY00. It is planned to achieve 175 Whr/kg at the cell level by FY05. More critical than specific energy is raising the cycle life limits to enable spacecraft lifetimes competitive with aircraft systems. At the low altitude orbits of such systems as a space-based JSTARS or AWACS storage elements should exceed 50,000 cycle lifetimes and approach 100,000 cycles. The technical challenges to increase energy density are severe: highly reactive chemicals (sodium, lithium, etc.); runaway electrochemical reactions; and general safety concerns. An additional focus is the development of high voltage PMAD components that allow electrical bus voltages of 70 V to 120 V resulting in a mass reduction of the electrical bus of 50-75%. Space power is considered a pervasive technology area, applicable to all spacecraft program offices as well as AFSPC, NASA, and other government agencies, and to commercial spacecraft.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	13.0	14.7	15.6	18.0	10.2	10.2

SP0901F Satellite Control. Develop and integrate satellite control technologies for the AF Satellite Control Network (AFSCN) to provide autonomous ground and space operations, portable ground operations and data dissemination, and advanced operator environments for satellite control. This effort emphasizes the development of systems with increased operational capability and low acquisition and maintenance costs. Enhanced capability is achieved by providing immediate information to the warfighter through portable systems and providing a continuous upgrade process with flexibility so changing requirements can be easily satisfied. Additionally, this provides a reduction in manpower requirements of 45% by FY98, and 66% by FY02; a reduction in operations and maintenance (O&M) costs (with an increase in capability) by 30% in FY00, and 50% by FY04. Decision support for anomalies will be added in phases from FY96 through FY99, on-board autonomous satellite health and status capability will be flight tested in FY02, machine learning systems will be added by FY04, and immersive operator environments will be added by FY05. Technology challenges include: developing reliable, verifiable self-learning computer systems, providing on-board autonomous satellite control, and verifying correct performance of highly intelligent ground and space systems. Users include AFSPC, USAF Space and Missile Systems Center SPOs, and select Civil, Navy, BMDO, and other agency offices.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.3	3.3	3.8	4.3	4.6	4.8

SP1006F Spacelift Propulsion. Develop and demonstrate advanced spacelift propulsion technology for military and nonmilitary space launch systems. These systems (solid, liquid, or hybrid) could be expendable vehicles or military multi-use vehicles. By FY00 the technology will be developed to improve the payload capability by 9% and reduce the O&S (Operations and Support) costs by 19% of expendable launch vehicles while improving the payload capability by 71% and reducing the O&S costs by 34% for multi-use vehicles. By FY05 the technology will be developed to improve the payload capability by 16% and reduce the O&S costs by 21% of expendable launch vehicles while improving the payload capability by 121% and reducing O&S costs by 65% for multi-use vehicles. By FY10 the technology will be developed to improve the payload capability by 21% and reduce the O&S costs by 28% of expendable launch vehicles while improving the payload capability by 170% and reducing the O&S costs by 79% for multi-use vehicles. All payoffs will be attained by improving mass fraction (solid systems) or thrust to weight (liquid systems), specific impulse, and reliability while decreasing hardware and support costs. Due to the chemicals involved in solid propellant manufacturing, processing, and firing, solid propellants will be constrained by many environmental regulations by the year 2000. Near term (within 5 years) solid propulsion programs will work toward developing new chemicals and processes used in motor manufacturing and created during solid rocket motor firing. These programs will be available for the EELV Phase I (medium lift) program technology insertion date. Additional technical challenges exist in developing low cost, environmentally clean solid propellants that maintain current performance capabilities of current propellants, and new solid motor case materials for low cost, low weight systems. Approaches like ultra high strength fibers (1000 ksi tensile strength) and lower density resins will help decrease motor volume due to reduced case thickness to overcome the technical challenges within the next ten years. Liquid engine improvement programs will work toward higher operating speeds, smaller components, fewer parts, new materials and manufacturing processes (like rapid prototyping), leak free connectors and purgeless seals. Additional technical challenges exist in developing fluid film bearings, metallic and non-metallic turbine materials, high temperature turbine materials, and low maintenance (easy to replace) components for near term system advances. Other liquid system technical challenges involve developing low cost LOX/RP-1 propellant additives to increase performance. High c* (combustion efficiency), high specific impulse systems will require developing systems with higher chamber pressures, and materials that can tolerate higher temperatures with high thermal conductivity. These improvements will support upgrades to current vehicles, EELV Phase II (heavy lift), EELV product improvement, and far term military reusable vehicles. This technology will support the warfighter and overcome the AFSPC range, survivability, and rapid response deficiencies by developing higher performing, lower cost engine systems while extending the life, range, and reliability of our current launch vehicles. Development programs will address Space Command's number one priority deficiency within the Space Lift Mission Area Plan (MAP) of reducing launch costs. Since all space and launch vehicle systems have propulsion sub-systems, advanced space propulsion technology supports a wide range of commercial and military customers including all spacecraft program offices at SMC and space missions within AFSPC. Specifically, technology developments in this area will support the AF Space Command and Space and Missile System Center top priority concept of responsive, low cost expendable launch vehicle development.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	22.6	32.2	27.0	27.6	29.9	33.3

SP1106F Orbit Transfer Vehicle Propulsion. Develop and demonstrate upper stage/spacecraft (chemical, solar electric, solar thermal) propulsion systems for reusable, or expendable orbit transfer vehicles. This will support the warfighter by developing systems for AFSPC with enhanced strategic agility for orbit transfer and insertion missions (movement from LEO to GEO). The resulting systems will enable the United States to sustain its global presence through timely and accurate placement of satellites for assured situational awareness. Non-chemical systems (solar electric, solar thermal) do this through available long-life space assets for orbit transfer or orbit insertion systems. Chemical systems do this through rapid response orbit transfer or orbit insertion systems. Spacecraft operational capabilities will be improved resulting in lower cost satellites that more effectively support the warfighter's critical information gathering and global communications needs. Spacecraft capability could be improved by using integral propulsion units, enabling orbital transfer, maneuvering, and repositioning/stationkeeping functions being performed by a single propulsion system. By FY00, the technology development for orbit transfer payload increases of 25% will be demonstrated for high power solar electric/solar thermal systems. Spacecraft operational capabilities will *also* be improved resulting in lower cost satellites that more effectively support the warfighter's critical information gathering and global communications needs. By FY05, the technology development for payload increases of 50% will be demonstrated for solar electric/solar thermal systems. By FY10, the technology development for payload increases of 100% will be demonstrated for solar electric/solar thermal systems. Because chemical orbit transfer systems work toward rapid response instead of long-life and are technically more mature then solar electric/solar thermal systems, discreetly different potential payoffs exist. By FY00, the technology development for payload increases of 5% will be demonstrated for chemical orbit transfer systems. By FY05, the technology development for payload increases of 10% will be demonstrated. By FY10, the technology development for payload increases of 15% will be demonstrated. Attaining the cost and weight goals for propellant and pressurization tanks can be achieved by overcoming the technical challenges of developing ultra-high strength graphite and non-graphite fibers overwrapping a thin, metal, fluid compatible inner liner. The use of advanced materials for highly flexible elastomeric bladders will meet the technical challenge of improving compatibility with propellants over a longer duration and decreasing leakage rates. For high power arcjets, the major technical challenge is cathode life. Technology needs to be developed to extend the lifetime up to 2500 hours. This will be accomplished with either new cathode materials or novel cathode designs. Since all space and launch vehicle systems have propulsion sub-systems, advanced space propulsion technology supports a wide range of commercial and military customers including all spacecraft program offices at SMC and space missions within AFSPC. Specifically, technology developments in this area will support the AF Space Command and AF Space and Missile System Center #2 priority concept of long-life, rapid response solar orbit transfer vehicle propulsion systems.

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Customer POC:

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	4.5	3.9	7.2	9.5	9.6	9.9

SP1206F Spacecraft/Satellite Propulsion (Solar Electric, Solar Thermal, Chemical). Develop and demonstrate spacecraft/satellite (solar electric, solar thermal, chemical) propulsion systems for long-life, responsive satellite vehicles. This will support the warfighter by developing systems for AFSPC with enhanced strategic agility and highly reliable reconnaissance/surveillance and communication capabilities. The resulting long-life systems (solar electric, solar thermal) and rapid response systems (chemical) will enable the United States to sustain its global presence through timely and accurate situational awareness. Spacecraft operational capabilities will be improved resulting in low cost, lightweight satellites that more effectively support the warfighter's critical information gathering and global communications needs. Solar electric and solar thermal systems can achieve the following improvements: by FY00, the technology development for on orbit life increases of up to 5% will be demonstrated in addition to repositioning improvements of 200% for low power systems; by FY05, the technology development for on-orbit life increases of 15% will be demonstrated in addition to repositioning improvements of 350%; by FY10, the technology development for on-orbit life increases of 45% with repositioning improvements of 500% will be demonstrated. Chemical systems can achieve advancements as follows: by FY00, the technology development for a 5% increase in either on-orbit life or repositioning will be demonstrated; by FY05, the technology development for a 10% increase in either on-orbit or repositioning will be demonstrated; by FY10, the technology development for a 15% increase in on-orbit life or repositioning will be demonstrated. Spacecraft propulsion performance challenges (thruster efficiency and specific impulse increases) work toward developing low power (200 watt) hall thrusters for micro and nano satellite technology. Near term challenges are to create thrusters that can start-up and continue operating efficiently at these low power levels. Approaches include developing several types of cathodes (for start-up and operation) and increasing the magnetic field intensity (for efficiency). Mid-term evaluation of this new system physics will enable far term increases in thruster efficiency to further reduce costs and increase performance. Parallel efforts in micro power processing unit technology (for this hall thruster) must be developed for the total system viability. Goals to improve mass fraction and producibility, and to reduce hardware (material/manufacturing) costs will be addressed by overcoming the technical challenges of developing new expulsion device designs, materials and fabrication processes. Near term hydrazine system mass fraction improvements reside in developing new propellant expulsion diaphragm assembly fabrication techniques, including hydroforming and superplastic forming of the diaphragm and outer shell pieces. These approaches will fulfill the technical challenges to improve reliability, dramatically reduce component costs, and improve the repeatability in key structural parameters such as diaphragm thickness. Since most space and launch vehicle systems have propulsion sub-systems, advanced space propulsion technology supports a wide range of commercial and military customers including all spacecraft program offices at SMC and space missions within AFSPC. Specifically, technology developments in this area will support the AF Space Command and Space and Missile System Center #2 priority concept of developing high performance solar satellite propulsion systems.

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LtCol David Lewis		
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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	1.2	1.1	1.5	1.8	1.9	1.4

I. DEFENSE TECHNOLOGY OBJECTIVES FOR HUMAN SYSTEMS

HS.01.05.A	21st Century Land Warrior
HS.02.00.F	Advanced Aircrew Escape
HS.03.06.AF	Aircrew Distributed Mission Training
HS.04.01.FN	Cognitive Engineering for Information Dominance
HS.05.06.FN	Crew Station Integration Demonstrations
HS.06.06.AF	Crew System Engineering Design Tools
HS.07.06.N	Development of Advanced Embedded Training Concepts for Shipboard Systems
HS.08.06.A	Force XXI Training Strategies
HS.09.02.AF	HelmetMounted Sensory Ensemble
HS.10.11.F	Integrated Technical Information to Improve Maintenance Performance and Operations
HS.11.11.F	Logistics Technologies for Flexible Contingency Deployments and Operations
HS.12.05.FN	Night Vision Goggle Technologies
HS.13.02.A	Precision Offset, High Glide Aerial Delivery of Vehicles, Munitions, and Equipment
HS.14.05.A	Rotorcraft Pilot's Associate
HS.15.05.A	Small Arms Protection for the Individual Combatant
HS.16.03.A	Thermal Signature Reduction for the Individual Combatant
HS.17.06.A	Warfighter Systems Modeling (WSM)
HS.18.06.FN	Weapon System Decision Support

HS 01 05 A. 21st Century Land Warrior. By FY97. demonstrate (in a robust squad exercise) the integration of risk mitigating technology upgrades to the dismounted Force XXI Soldier System. Specifically demonstrate: wireless video/data interfacing to existing weapon sensors; high resolution (1000 line) miniature display integrated with Advanced Image Intensifier (AI 2); integrated helmet antenna for soldier radio; voice input for control of computer/radio; Forward Observer/Forward Air Controller (FO/FAC) reconnaissance/target hand-off system; (electronics miniaturization) integration including multi-chip module technologies; self-contained navigation; power management processes/software; reduced weight materials technologies including body armor protection against armor- piercing rounds and multi-functional protective uniform layers; and laser-based soldier-to-soldier combat identification. By FY99, demonstrate integration of additional technology upgrades to the Force XXI Soldier System in the areas of: manportable chemical agent detection; integrated sight; wireless video/data interfacing to integrated sight, Javelin, and objective individual combat weapon (OICW); personal status monitoring, improved radio technology including higher data rates and packet relay protocol; indirect view soldier imaging system including image enhanced night vision and high resolution helmet mounted display; rapid target acquisition; further electronics miniaturization including micro-electrical mechanical systems; power management; and alternate power sources including fuel cells.

This program supports the Land Warrior System, and the following Joint Warfighting Operational Needs: Military Operations in Urban Terrain, Dominant Battlespace Knowledge, Precision Force, Combat Identification, and Chemical-Biological Detection. The lead performing agency is the U.S. Army Natick RD&E Center, Natick, MA.

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DSN 227-1646

USD(A&T) POC:
Dr. Joseph Osterman,
Dir, E&LS (DDR&E),
DSN 227-8714

Customer POC:
Dismounted Battlespace Battle Lab,
ATSH-IWC,
Col Canada,
DSN 835-2310

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	12.5	16.2	6.3	7.0	0	0

HS 02 00 F. Advanced Aircrew Escape. Develop and demonstrate technologies to provide safe ejection at adverse attitude, low altitude, and airspeeds up to 700 knots for an expanded range of aircrew size and weight. Critical technologies to achieve objective are controllable propulsion, digital flight control system, and high speed windblast protection. Products will be transitioned to USAF and USN aircraft and will be applicable to the improvement of current ACES II and NACES ejection seats and to a 4th generation escape system. Foreign technology (Russian K-36) will be exploited. Other contributing technologies include biodynamic modeling and simulation. Potential target aircraft for advanced aircrew escape systems includes the JAST. Payoffs are decreased aircrew fatalities and injuries, escape capability throughout the flight envelope, full aircrew accommodation, and reduced life cycle costs. By FY97, demonstrate safe escape up to 700 knots. By FY97, transition fourth generation technology to SPO. By FY99, demonstrate full accommodation seat prototype; by FY01 initiate joint USAF/USN EMD program.

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AFMC/CC,
Gen Butch Viccellio,
DSN 787-6033

ACC/CC,
Lt Gen Brett Dula,
DSN 574-3204

CNO,
Adm J.R. Boorda,
DSN 225-4412

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	7.9	8.5	8.8	9.9	10.5	10.7

HS 03 06 AF. *Aircrew Distributed Mission Training*. By FY98, develop, demonstrate and evaluate affordable *Training* technologies that will improve aircrews' training capability in local and geographically distributed modes of multi-aircraft formations. Develop and demonstrate an aviation training strategy that makes the most effective use of simulators, training devices and live exercises for initial flight skills through unit combat tasks. In FY97, develop next generation advanced simulation for multirole aircrews allowing operational/tactics test and evaluation, and establish minimum fidelity requirements for critical aircrew skills training, that will decrease the cost of providing high fidelity simulation systems by 75 percent. By FY98, develop and demonstrate multirole aircrew simulation testbed, integrating four advanced simulation cockpits with next generation visuals in 360 degree displays, with an advanced control station and threat systems that will increase pilots' capability to conduct: air superiority missions by 30 percent, close air support missions by 25 percent and interdiction missions by 35 percent.

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TRADOC, USAAVNC,
Aviation Trng Bde,
Col Edward Littlejohn,
DSN 464-7555

NAVAIR, PMA205,
Capt Ray Morris,
DSN 664-2245

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	5.9	6.4	6.4	0	0	0

HS 04 01 FN. Cognitive Engineering for Information Dominance. Explore and establish design guidelines and methods for quantifying information dominance in a distributed, system of systems battlespace. By FY97 demonstrate metrics for assessing crew situational awareness and workload associated real-time information (imagery) in-the-cockpit for attacking time-critical mobile targets and for related ship-board applications. Also, by FY97 an information requirements analysis will have been completed for an advanced Measurement and Signatures Intelligence (MASINT) analyst workstation and an enhanced imagery analyst workstation capable of supporting rapid target nomination and location cue dissemination functions. By FY98 explore information warrior modeling tools based on the OODA (Observe-Orient-Decide-Act) loop. Out-year technology efforts will emphasize IMINT and SIGINT correlation and operator interfaces for multi-spectral IMINT systems. Technology will be transitioned to engineering development through the USAF Theater Missile Defense Attack Operations Integrated Product Team, and through the Aerospace Control, Intelligence/Reconnaissance/Surveillance, and Theater Battle Management Technology Planning Integrated Product Teams, and through Navy Program Managers.

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AIA/CC,
Brig Gen
Michael V. Hayden,
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Hq Marine Corps C4I/CSIM,
Maj Gen
David A. Richwine,
DSN 224-2604

PEO
(Surface Combatants),
RAdm G. Hutching,
DSN 332-7395

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	5.2	5.8	5.5	5.2	5.1	4.9

HS 05 06 FN. Crew Station Integration Demonstrations. Advance the state-of-the-art in crew station design through *Design Integration* applications, demonstrating in full operational context that crew-centered methods, metrics and tools can be synergistically exploited to expand vehicle operational envelopes, improve mission effectiveness, suitability and affordability for operated systems. Quantify the contribution of the totally integrated crew station design on overall system capability. Demonstrate that crew station integration in full operational context, integrating constructive, virtual and live elements, promote user acceptance early in system concept development, while reducing risk and demonstrating maturity for system integration. Demonstrate reductions in crew size, enhancements to situational awareness and improvements in weapon system performance through the integration of new pilot-vehicle interface technologies into existing or future cockpits for fighters, transports and special operations aircraft. By FY97, complete five *Design Integration* applications across operational missions and crew sizes. By FY98, for transport cockpits, refine designs, evaluate designs in piloted simulation, and conduct an operational demonstration of Real Time Information to the Cockpit (RTIC), allowing pilots to directly access RTIC capabilities integrated with pilot's controls and displays. By FY98, for fighter cockpits, refine and finalize technology applications for single-seat, air-to-surface, in-weather threat avoidance and precision weapon delivery. By FY99, complete operator-in-the-loop virtual mission demonstration. By FY02, integrate constructive, virtual and live elements and demonstrate crew system effectiveness through distributed simulation operational exercise.

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<u>Customer POC:</u>
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DSN 787-6033

ATZK-MW,
Col Porter,
DSN 464-8247 (Mounted Battlespace Battle Lab)

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	3.1	2.5	2.2	2.7	2.9	2.7

HS 06 06 AF. Crew System Engineering Design Tools. Provide the building blocks for a new design technology applicable to all defense acquisition programs where the crew system interface is key, in the form of software-based engineering design tools. Technical objectives include: (a) establishing crew/system interface design principles, electronic databases and computational models that enhance the warfighter's interface with equipment, and (b) transition reliable methods for assessing the impact of new technologies and specific battlefield environments on crew performance and vulnerability. By 1996, an on-line human accommodation database, multi-variate accommodation analysis tools, and a database and model for intelligence-based decision support systems will be operational. By FY97, develop a computer-aided human engineering design system combining 3-D rapid prototyping techniques, embedded human performance models, and advanced simulation methods. By 1997, develop media to visualize human research data and translate it into design principles. By 1998, model the mechanisms for crew protection. By FY98, formally evaluate model predictions and system usability, targeting a 25-percent improvement in the existing rotorcraft crew station design cycle time, a 15-percent reduction in cockpit equipment/crew procedure design flaws, and the ability to quantitatively predict system performance by Milestone 1. By 1999, develop interactive, graphical man-models of human physical fit and performance integrated with CAD/CAE processes. By 2002, integrate a set of virtual reality-based, human system models into rapid prototyping simulation environments. Reduce the time needed to develop the crew system by 50 percent, design-induced crew errors by 75 percent, and the need for crew station redesign at the test and evaluation stage by a factor of ten.

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Col Porter,
DSN 464-8247 (Mounted Battlespace Battle Lab)

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	5.2	6.2	6.0	6.0	6.0	5.3

HS 07 06 N. Development of Advanced Embedded Training Concepts for Shipboard Systems. Develop and demonstrate an Advanced Embedded Training Capability to improve CIC team decision-making performance by 25-40 percent, reduce training time by 40 percent, and reduce the number of required instructors by 50 percent. The system will automatically track team member behavior, assess performance, provide on-line feedback, and facilitate computer-assisted coaching. In FY96, initial enabling technologies (eye tracking, keystroke recording, speech recognition, human performance modeling) will be applied, integrated and demonstrated on a single watchstation. In FY97, automated diagnostic routines and system-generated feedback mechanisms will be integrated into the system, and a team-level demonstration will be completed. The final operational demonstration will be conducted, and initial transition plans to Aegis and the Battle Force Tactical Trainer (BFTT) finalized in FY98.

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Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	3.0	4.0	4.0	0	0	0

HS 08 06 A. Force XXI Training Strategies. By FY2001, develop and demonstrate new training and evaluation technologies that prepare operators and commanders to take maximum advantage of evolving digitized C3 systems. This training research will incorporate the use of virtual, constructive and live simulations to demonstrate and evaluate selected prototype training techniques. By FY1997, evaluate a prototype staff training package using Force XXI Battle Command Brigade and Below (FBCB2) computer-based Appliqué systems, and determine the utility of existing data records for assessing leadership. By FY1998, identify high-potential new methods for predicting leader performance in operational assignments of the future. BY FY1999, evaluate training and performance assessment tools developed for units participating in Division XXI. The training techniques and strategies will be demonstrated and evaluated in Advanced Warfighting Experiments (AWEs). These techniques will result in a 50% improvement in training efficiency (number of tasks trained in the same amount of time). Also, by FY1999, specify methods for measuring the leadership capabilities of pre-commissioned to company-grade leaders in regular and Special Forces units with a 10% increase in measurement reliability over current procedures. By FY2000, field test and validate these new methods and techniques for leader development.

Svc/Agency POC:
ARI, SARD-TR
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USD(A&T) POC:
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Dir, E&LS (DDR&E),
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Customer POC:
Maj Gen
Lon E. Maggart,
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Mounted Battlespace Battle Lab,
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Col Porter,
DSN 464-8247

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	1.3	1.9	2.1	3.3	3.5	2.3

HS 09 02AF. Helmet-Mounted Sensory Ensemble. Develop and demonstrate advanced Helmet-Mounted Tracker and Display (HMT/D) technologies to improve mission effectiveness, survivability, and flight situation awareness, primarily for airborne weapon systems. An ATD for a Visually-Coupled Acquisition & Targeting System (VCATS) is underway to quantify the operational utility of the rapid line-of-sight cueing of missile seekers to air and ground targets, as a new crew interface, forming the key to exploiting the new generation of high off-boresight missiles. By FY97, a prototype HMT/D will be flight demonstrated on two F-15C aircraft, and evaluated by the USAF Air Combat Command, showing improved weapon launch opportunities translating to improved mission success rates. The Helmet-Mounted Sight Plus (HMS+) will integrate a miniature color display with the VCATS helmet tracker technology and the on-board fire control system hardware and demonstrate an exceptional advance in performance and reliability. Image source, head tracker, and Helmet-Vehicle Interface (HVI) technologies will be developed to improve HMT/D system performance and safety. Technology will be transitioned to Engineering and Manufacturing Development (EMD) for the Joint Helmet-Mounted Cueing System program, the F-15 SPO and the USN/USAF AIM-9X missile program.

Svc/Agency POC:
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DSN 227-8714

Customer POC:
ACC/CC,
Lt Gen Brett Dula,
DSN 574-3204

AFMC/CC,
Gen Butch Viccellio,
DSN 787-6033

CNO,
Adm J.R. Boorda,
DSN 225-4412

ATSH-IWC,
Col Canada,
DSN 835-2310 (Dismounted Battlespace Battle Lab)

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	7.4	6.9	4.9	2.6	0.4	0.3

HS 10 11 F. Integrated Technical Information to Improve Maintenance Performance and Operations. Design, develop, demonstrate, and transition logistics technologies that will improve logistics and maintenance support functions essential to field and depot maintenance operations in both peacekeeping and combat environments. In order to enhance the performance of the flightline and depot level technician's performance, technologies are being developed to provide all the primary and supporting technical information required to perform their jobs. The technologies being developed to accomplish this objective include analytic business process information tools, hand-held and "wearable" portable maintenance aids, advanced diagnostics, automated authoring, tagging, and verification of electronic technical data, and special purpose display devices. These technologies also support aircraft battle damage/peacetime accident assessment and repair, Wing level logistics planning and C2, and combined sortie generation support requirements. The integrating vision is to take advantage of existing DoD and commercial initiatives combined with the products of this work to provide seamless, automated information support to and between the flightline and the depot. This work directly support the AF lean logistics and two-level maintenance initiatives. By FY97, requirements analysis of integrated information systems of air logistics centers program depot maintenance processes will have been completed, as will a similar effort for aircraft battle damage assessment and repair activities at combat logistics support squadrons (CLSS). Technical transition to these products to multiple Air Logistics Centers, System Program Offices, MAJCOMs and CLSS's is in the form of technical reports, demonstrations, professional symposia, journal articles, field tests, demonstrations and direct support and consultation with target users. Many products previously developed are now in use or being incorporated by a variety of DoD and industry organizations.

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ACC/CC,
Lt Gen Brett Dula,
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AF/LG,
Lt Gen George Babbitt,
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ATCL-C,
Col Williams (Customer Service Support Battle Lab)

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	4.1	5.0	5.8	6.2	6.8	7.7

HS 11 11 F. Logistics Technologies for Flexible Contingency Deployments and Operations. In order to reduce the logistics airlift requirements and "footprint" for deployed units, develop, demonstrate and transition high leverage technology tools to support flexible and rapid contingency deployments, prediction of support asset requirements, and beddown/operations at austere field operations. Work includes development, demonstration, and field testing of technologies for more reliable aircraft common support equipment, cargo handling, battle damage assessment and repair, non-ODS aircraft fire suppression agents, and deployment planning and beddown prediction and analysis tools. Programs will demonstrate more accurate battle damage repair techniques that can be implemented in deployed locations using integrated maintenance information and special repair methods for engines, composites, transparencies and low observables. By FY97, preliminary design for modular aircraft ground power support equipment will significantly reduce logistics airlift requirements and support reduced footprints for deployments will be completed; live-fire extinguishing testing of solid propellant gas generators will be accomplished with design data transitioned to Air Force and Navy aircraft development program offices. These data will provide low cost/non ODS alternatives for aircraft fire suppression; first article advanced computer logistics deployment support planning tools will be also demonstrated, in direct support of multiple DoD agencies and operating MAJCOMs, providing faster and more accurate integrated deployment planning, asset prediction, and probable significant deployment and sustainment cost savings.

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ACC/CC,
Lt Gen Brett Dula,
DSN 574-3204

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Lt Gen George Babbitt,
DSN 225-3153

AFSOC/CC,
MajGen
James L. Hobson, Jr.,
DSN 579-2323

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	4.8	6.0	6.3	7.0	7.8	8.2

HS 12 05 FN. Night Vision Goggle Technologies. Two programs are commencing in FY1996 to develop and demonstrate enhanced night vision goggle and sensor capabilities to improve mission safety and effectiveness during night aviation tactical operations. The approaches being taken by the Air Force and the Navy are complementary and are expected to result in greatly increased field-of-view (100 degrees) and significantly enhanced sensitivity, as well as the ability to combine into a single image both low light level visible and infrared information. The panoramic night vision goggle ATD will increase the intensified viewing area by 240%, taking advantage of a breakthrough optical technique combined with a newly developed, smaller format image intensifier. The color night vision sensor ATD will develop low light level charge-coupled device (LLLCCD) technology, and will fuse this visible imagery with the produced from IR sensors. Unlike any other night vision system, the low profile design of the panoramic goggle will allow for it to be retained safely on the warfighter's head throughout an ejection sequence. This is extremely important for escape, evasion and rescue. Additionally, the development and integration of an ultra lightweight electroluminescent display will offer flight and navigation symbology to the pilot. These technologies have applicability to a wide variety of platforms, including F-15, F-16, F/A-18, A-10, AV-8B, C-130, C-17, B-1., B-52, MH-53, and MH-60 aircraft.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	2.6	5.0	7.8	8.8	6.3	6.6

HS 13 02 A. Precision Offset, High Glide Aerial Delivery of Vehicles, Munitions, and Equipment. Demonstrate revolutionary technologies for the reliable precision guided delivery of combat essential munitions/sensors and equipment using a high glide wing technology and incorporating a low cost, modular GPS guidance package and control system. This technology will provide a 6:1 or better glide ratio. By the end of FY96, develop a modular GPS guidance package and demonstrate precision high glide capability of a 500 pound payload using semi-rigid wing technology. By FY99, demonstrate precision high glide of a 5,000 lb. payload, using an advanced guidance package and high glide wing. High glide technology will significantly enhance the military aerial delivery capability through substantially higher glide ratios than are possible with ram air parachutes and will directly benefit the initial deployment of early entry forces. Technical barriers include accurate characterization of decelerator aerodynamic coefficients of performance.

This supports the following Joint Warfighting Operational Needs/Capabilities: Military Operations in Urban Terrain, Precision Force, Joint Readiness, and Real-Time Logistics Control within the mission areas of early entry brigade airdrop, SOF airborne operations, and logistical resupply (tactical and during OOTW). Transition Opportunities for these technologies, outside of Military Airdrop Systems, exist in the areas of Sub-Munition Dispensers, UAVs, Aircraft Decelerators, Aircraft Anti-Spin Devices, and Inter-Planetary Recovery Systems.

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Customer POC:
Early Entry, Lethality, and
Survivability Battlelab (EELS),
Mr. Ken Foley,
DSN 680-5854

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	0.9	1.2	1.2	1.3	0	0

HS 14 05 A. Rotorcraft Pilot's Associate. By FY98, develop and demonstrate through simulation and flight test, a knowledge based associate system for cognitive decision aiding. The Rotorcraft Pilot's Associate will apply artificial intelligence and advanced computing technologies to create a cooperative man/machine system which understands the intentions of commanders and combat helicopter crew members and uses information from on-board and off-board sensors and mission equipment elements to develop plans to jointly achieve mission objectives. RPA will provide high speed data fusion processing, real-time automated continuous mission planning, context sensitive reconfiguration of mission equipment controls and settings, efficient and intuitive cockpit information management, and greatly improved situational awareness. In addition, RPA will serve as the mission equipment integrator for the air crews and will collect, synthesize, and disseminate pertinent battlefield information. Measures of Performance (MOP) beyond a "Comanche- Like" baseline during day/night, clear and adverse weather battlefield conditions include: reduction in mission losses by 30 to 60 percent; increased targets destroyed by 50 to 150 percent; and a reduction in mission time lines by 20 to 30 percent.

Svc/Agency POC:
SARD-ZT,
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Customer POC:
SFAE-AV-RAH,
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James Snider (Commanche PM),
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SFAE-AV,
Mr. Paul Bogosian (Deputy
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DSN 693-1236

SOAE,
Mr. Gary Smith (SOCOM
Acquisition Executive),
DSN 968-5247

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	27.4	25.1	17.7	6.3	0	0

HS 15 05 A. Small Arms Protection for the Individual Combatant. Develop armor materials to minimize penalties associated with small arms protective body armor (technical barriers include: lightweight high performance ballistic protective materials; excess weight, thickness, and cost; rigidity of materials; manufacturing methodology). By the end of FY96, determine viability of "flexible" ballistic protective vest for small arms protection. By the end of FY98, demonstrate advanced material system for protection against combined fragmentation and small arms threats (known ball threats up to and including 0.30 caliber), to be measured by a 20-30 percent reduction in areal density (weight for given area) over current small arms protection without significantly increasing other penalties.

This supports Joint Warfighting Operation Needs/Capabilities: Military Operations in Urban Terrain, and Joint Countermine. Technologies will benefit: 21CLW, Land Warrior, Air Warrior, Modular Body Armor, Extremity Armor, Ranger Body Armor, Personnel Armor for Ground Troops Vest and Helmet, Combat Vehicle Crewman Helmet and Vest, Body Armor Set Individual Countermine, Explosive Ordnance Disposal Suit, and Inconspicuous Body Armor. Other transitions include: civil law enforcement agencies; aerospace and automobile industries; and recreational industries.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
SARD-ZT, Dr. A. Fenner Milton, DSN 227-1646	Dr. Joseph Osterman, Dir, E&LS (DDR&E), DSN 227-8714	Dismounted Battlespace Battle Lab, ATSH-IWC, Col Canada, DSN 835-2310

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	1.7	1.1	0.9	0	0	0

HS 16 03 A. Thermal Signature Reduction for the Individual Combatant. By the end of FY97, demonstrate textile materials that reduce the contrast between soldier's thermal signature and the background by 30 percent, without significant degradation of the current level of visible or near-infrared camouflage protection. By the end of FY99, demonstrate combat uniform systems that reduce the soldier's thermal system signature to blend with background levels, providing multispectral camouflage protection to the Dismounted Land Warrior. The technical challenge entails integrating signature reducing materials/technologies into a textile substrate while maintaining basic fabric characteristics (durability, flexibility, breathability, etc.).

This supports Joint Warfighting Operation Needs/Capabilities: Military Operations in Urban Terrain, and Joint Countermine. These efforts will transition to: Joint Service Lightweight Integrated Suit Technology II, 21st Century Land Warrior, Advanced Aircrew and Armor Crew Ensembles, and Advanced Battledress Uniforms.

Svc/Agency POC:
SARD-ZT,
Dr. A. Fenner Milton,
DSN 227-1646

USD(A&T) POC:
Dr. Joseph Osterman,
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Customer POC:
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ATSH-IWC,
Col Canada,
DSN 835-2310

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	0.4	0.4	0.4	0.4	0	0

HS 17 06 A. Warfighter Systems Modeling (WSM). Develop a robust simulated environment to support analytical capabilities and promote rigorous dismounted combatant trade analyses to quantify and evaluate alternative system concepts, equipment, and operational policy. This automated environment will support the virtual prototyping, evaluation and effectiveness assessment of proposed warfighter concepts and equipment such as the 21st Century Land Warrior (21 CLW). This will combine numerous engineering level models, i.e., individual casualty (ballistic, chemical, blunt trauma, etc.), protective materiel performance, individual target detection/recognition, human physiological performance, and individual suppression, with supporting data into a single, warfighter simulation. It will assess and quantify performance of dismounted combatant systems such as 21 CLW under battlefield conditions that would not otherwise be possible during peacetime testing due to human risk, cost, and/or prohibition of law.

By FY98, provide modeling, simulation and analytic tools facilitating the design and Cost & Operational Effectiveness Analysis (COEA) of the Land Warrior Program. Deliverables will include detailed real-time engineering level models of wound ballistics and blunt trauma. Additional research efforts will provide improved methodologies in the following areas: enhanced anatomical databases; bullet and flechette penetration submodels; body armor failure submodel; and a fully articulated anatomical model.

This supports Joint Operational Needs/Capabilities: Military Operations in Urban Terrain, Combat Identification, Joint Countermine, Chemical/Biological Warfare Detection, and Counterproliferation. These efforts will benefit: 21st Century Land Warrior, Air Warrior, Land Warrior, Combined Arms Tactical Trainer (CCTT), Modular Body Armor, Body Armor Set Individual Counter Mine, Joint Service Lightweight Integrated Suit Technology II, Objective Individual Combat Weapon, HLA Computer Generated Forces, and Objective Crew Served Weapon.

Svc/Agency POC:
SARD-ZT,
Dr. A. Fenner Milton,
DSN 227-1646

USD(A&T) POC:
Dr. Joseph Osterman,
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DSN 227-8714

Customer POC:
Dismounted Battlespace Battle Lab,
ATSH-IWC,
Col Canada,
DSN 835-2310

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	1.8	1.8	1.5	0.9	0	0

HS 18 06 FN. Weapon System Decision Support. Provide performance enhancing decision support technology and systems for intelligent cockpits, command posts, and shipboard command centers. Technology goals are to demonstrate decision aids that are maintainable, minimize cost and enhance both the mission effectiveness and survivability of global forces. For combat aircraft, projected benefits include lowering aircraft weight by 5,000 pounds when compared to the F-15E mission performed by the single-place fighter. This technology will significantly improve command decision-making by enhancing situation assessment, option generation and reducing ambiguity in operating and directing land, sea, and air forces, while enabling the warfighter to act as battle manager relieved of lower level details of system operation. Transition decision support systems that operate fast enough to make a difference to battle management and combat success. By FY97, transition missile trajectory and target prediction algorithms to Talon Lance, demonstrate dynamic cockpit function allocation, and provide a software verification and validation tool with commercial potential. By FY98, test a cockpit decision aid capable of detecting and correcting hazardous errors, demonstrate an aid for real-time inflight route optimization, and recommend an aid for air target prioritization. By FY99, demonstrate a decision support system for shipboard command centers and combat operations centers that operates in real-time and improves situation assessment by 40 percent. By FY00, transition a full-mission route planning and optimization aid, test a life-cycle support aid, flight test a knowledge-based target assignment algorithm, and demonstrate collaborative Joint Commander. FY01, verify a 50 percent gain in target kills achievable through combat aircraft decision support.

Svc/Agency POC:
AFMC/ST,
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DSN 787-6977

Chief of Naval Research,
RAdm Mark Pelaez,
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Customer POC:
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ACC/CC,
Gen Joe Ralston,
DSN 574-3204

CNO,
Adm J.R. Boorda,
DSN 225-4412

ATZL-CDC,
Col Eberly,
DSN 552-3323
(Battle Command Battle Lab)

Hq Marine Corps C4I/CSIM,
Maj Gen
David A. Richwine,
DSN 224-2604

PEO
(Surface Combatants), RADM G.
Hutching, DSN 332-7395

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	5.0	6.2	6.4	6.5	6.5	6.2

J. DEFENSE TECHNOLOGY OBJECTIVES FOR WEAPONS

WE.01.04.ANFC	Missile Agility/Kinematic Enhancement (Make)
WE.02.07.AN	Land and Sea Mines
WE.03.08.ANF	Combat aircraft (A/C) Infrared Countermeasures (IRCM)
WE.04.04.CF	High Power Lasers for Theater Missile Defense
WE.05.02.F	AntiMateriel Warhead Flight Test (AWFT)
WE.06.02.N	Concentric Canister Launcher (CCL) ATD
WE.07.02.A	Future Missile Technology Integration (FMTI) [Formerly TACAWS]
WE.08.02.F	Miniaturized Munition Technology (MMT) Guided Flight Tests
WE.09.08.E	DARPA/TriService IRCM Laser Technology
WE.10.08.F	GroundBased Laser ASAT
WE.11.12.D	Advanced Unitary Penetrator (AUP)
WE.12.02.ANFH	AntiJam GPS/Inertial Competent Munitions
WE.13.02.A	Counter Active Protection System (CAPS)
WE.14.11.A	Munitions Logistics Survivability
WE.15.02.N	Low Cost Missile
WE.16.05.A	Objective Individual Combat Weapon (OICW)
WE.17.02.F	Hammerhead
WE.18.02.A	Direct Fire Lethality
WE.19.08.F	HPM/LASER Aircraft Self Protect Missile Countermeasures
WE.20.02.AF	NonLethal Technologies
WE.21.02.NE	Fiber Optic Gyro Based Navigation Systems
WE.22.09.F	High Power Microwave C2W/IW Technology
WE.23.08.ANF	Modern Network Command and Control Warfare (C2W) Technology
WE.24.08.ANF	Sensor Fusion/Integrated Situation Assessment Technology
WE.25.02.A	Multimode Air Frame Technology Demonstration (formerly LONGFOG)
WE.26.02.N	Cruise Missile RealTime Retargeting
WE.27.02.N	Concurrently Engineered BallJoint Gimbal Imagery Seeker

WE.28.02.A	Low Cost Precision Kill (LCPK) Technology Demonstration
WE.29.02.N	AntiTorpedo ATD

J. DEFENSE TECHNOLOGY OBJECTIVES FOR WEAPONS (CONT)

WE.30.08.N	Advanced Electronic Countermeasures (ECM) Transmitter for Ship Self Defense
WE.31.02.N	Explosive Ordnance Disposal (EOD)

WE.01.04.ANF. Missile Agility/Kinematic Enhancement (MAKE). Demonstrate, through a series of system and component design, ground test and flight test efforts, a set of high payoff strategic and tactical missile technologies which will provide much improved operational effectiveness for various US weapon systems.

Strategic technology development will focus on advanced ballistic intercept missile configurations such as Standard Missile. Demonstrate by FY98, through flight tests, missile response times that are less than one-third of those currently achieved and lateral aerodynamic maneuver levels that are 2-3 times those currently achieved using a Standard Missile size airframe. By FY99 demonstrate, through flight tests, enhanced lateral maneuverability under low Q conditions (where aerodynamic control alone is insufficient to produce the desired lateral maneuver) using a Standard Missile sized airframe incorporating a forward to mid-body mounted jet reaction thruster (having a thrust magnitude on the level of the AIM9 motor) integrated via the autopilot with the missile's tail control surface.

Tactical technology developments will focus on advanced anti-air missile configurations including Sidewinder, AMRAAM and ship defense systems. While the Navy and Air Force are both developing advanced flight controls using reaction jet control (RJC) technologies, fundamental differences in implementation and target application produce an entirely different set of technology development and system engineering challenges.

Advanced flight control technologies involve hybrid canard-RJC on a Sidewinder sized airframe. A standalone RJC system which is independent from the missile main motor will be developed. Milestones include the demonstration, by FY98, through flights tests, of a 400º/sec body turn rate and 60-g lateral acceleration capability. This effort supports an increased survivability of surface and air platforms against potential increasingly sophisticated threat weapons, i.e., current and next generation Russian and French short-range anti-air missiles and current and next generation supersonic anti-ship cruise missiles. Canard-RJC will increase Navy Air Platform survivability against current and anticipated threat short range missiles and will increase the rapidity of pitch over maneuvers immediately after vertical launch as well as provide end-game lateral maneuverability for hit to kill lethality against current and anticipated supersonic anti-ship cruise missiles. High body turning rates and hi-g (400º/sec; 60g) airframes will reduce the next generation short range air-to-air missile turn radius by a factor of eight when compared to the AIM-9 Sidewinder and double the outer boundary intercept range. The airframe component technologies that will be demonstrated are a lightweight hybrid composite material airframe structure, an ultra high-speed electromechanical fin actuator; adaptive robust autopilot designs based upon H-infinity, *u*-synthesis design techniques and canard-RJC flight control system.

Advanced flight control technologies will be developed involving hybrid tailfin-RJC primarily for advanced AMRAAM application. The Air Force has chosen RJC. technique which use the main missile motor as an energy source. In addition, an electronically steered, conformal active RF seeker is being developed for flight demonstration on the advanced missile airframe. The Air Force will demonstrate, by FY00, unguided flight tests, the ability to reorient an AMRAAM sized vehicle through 180 degree flight path angle in just under 3 seconds after launch. This turning performance is possible due to very robust, nonlinear flight control software which

enables the missile to capture 90 degree angle of attack approximately 1 second after launch. Upon reorientation toward a very high off boresight target, a kinematic flyout capability of more than 25 miles to the beam, and more than 15 miles to the rear of the launch aircraft will be demonstrated. In addition, this effort will demonstrate, by FY02, captive carry experiments, an electronically steered seeker concept with an instantaneous field of regard of more than 155 degrees off-boresight. This effort will also demonstrate, by FY04, guided flight test, an integrated advanced seeker/airframe which will provide a tremendous rear hemisphere intercept capability while also improving AMRAAM forward hemisphere performance. This activity supports documented Air Combat Command AIM-120 kinematics and seeker deficiencies as well as Aerospace Control TPIPT identified next generation Dual Range Missile technology needs. The time frame for demonstration of these technologies will allow timely transition of these technologies to planned AMRAAM follow-on system improvements as well as planned next generation missile Demonstration/Validation programs.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. David S. Siegel	Mr. James Chew	Col. Patrick Garvey
ONR	DDR&E/AT	ACC/DRA
703-696-0554	703-695-0005	DSN 874-5914

Customer: ESSM; Sidewinder; STANDARD Missile; AMRAAM, AIM-9X, Navy Air and Sea systems Commands.

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	9.1	19.3	22.6	18.0	13.7	12.6

WE.02.07.AN. Land and Sea Mines. Develop and demonstrate an affordable rapidly deployable land mine system for early entry operations with 50% greater kill probability against armor vehicles. To achieve this objective the Intelligence Minefield (IMF) Advanced Technology Demonstration (ATD) will internet Wide Area Munitions (WAMs) and advanced acoustic sensors into an autonomous anti-armor/anti-vehicle system by demonstrating: 1) communication, command and control, 2) sensor fusion of acoustic sensor data, 3) autonomous implementation of engagement tactics, 4) advanced acoustic sensors and 5) exportable combat and target information. In FY96-97, the IMF ATD will demonstrate (through field test and simulation/modeling) an integrated IMF system that will internet WAMs and advanced acoustic sensors to increase WAM minefield effectiveness. The advanced acoustic sensors will have a detection range of 2-3 km and a tracking capability of up to seven target vehicles. Also demonstrated will be a control station that will communicate, command and control two minefields consisting of 20-40 WAMs while maintaining an interface to the Maneuver Command System (MCS). Sea mine technology will address the need for detection, tracking and attack of a broad spectrum of combatants on land and in coastal water environments, minefield communications, such as Identify Friend or Foe (IFF) and intermine sensor fusion for enhanced minefield effectiveness and tactical flexibility. By FY97 demonstrate technologies to detect, classify, and localize quiet submarines and surface ships at medium water depth (150 to 1000 ft depth). By FY03 demonstrate feasibility, expanded effectiveness, and flexibility, and remote command capability of intra-communicating sea minefield network concept.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. John Appel ASARDA (703) 697-7928	Mr. James Chew (703) 695-0005	Mr. Eric McGrath US Army Engineer School (314) 563-7340
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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	6.3	5.8	3.5	3.6	3.6	3.6

WE.03.08.ANF: Combat Aircraft (A/C) Infrared Countermeasures (IRCM). Develop IR countermeasures for combat aircraft with several sub-objectives.: (1) Under TACAIR DIRCM ATD, develop and demonstrate a functionally integrated IRCM warning, pointing/tracking and open-loop laser jamming capability. By FY98, conduct field and P3 Orion aircraft trials to demonstrate: IR missile warning with a 65% improvement in detection range; sub-millisecond hand-off to an Army ATIRCM pointer/tracker; 3-line, mid-IR laser coupling with the ATIRCM jamming head; and simultaneous IRCM laser jamming in 3 mid-IR missile threat bands. (2) Develop/integrate and demonstrate a closed-loop IRCM capability suitable for large aircraft self-protection (e.g., C-17, C-5, C-141) against advanced classes of IR missiles with inherent, sophisticated CM rejection capability. By FY99, conduct live-fire and captive-carry IR missile tests versus a functionally integrated IRCM suite composed of: baseline and advanced MWS technology (2X improvement in threat missile detection range); passive angular cueing/hand-off to active missile tracking (90:1 improvement in angular resolution); and an advanced laser transmitter capable of protecting large aircraft IR signatures 10-100X the baseline (suppressed signature helicopters and SOF aircraft). (3) Under Multi-Spectral CM ATD, develop and demonstrate a compact, laser-based CM solution for P^3I into the Army's Advanced Threat IRCM - Common Missile Warning System (ATIRCM-CMWS). By FY99, conduct live fires of multi-color / imaging IR missiles versus subject multi-line, fiber-optic fed, laser subsystem -- demonstrating 4X increase in J/S, 2-3X reduction in laser jam head volume, and an overall reduction in ATIRCM-CMWS system weight of 40 pounds (18%). (4) Develop and demonstrate integrated electro-optical/infrared countermeasures (EO/IRCM) technologies to defeat both the advanced IR/imaging IR missile threat, and the so-called "adjunct" tracking subsystems. The "adjuncts" augment the tracking functions, in the optical/thermal spectral region, of surface-to-air, anti-aircraft and man-portable air defense (MANPAD) systems to give them a day/night tracking capability. In addition, adjuncts are also fielded on threat fighter aircraft in the form of advanced IR search/track (IRST) and passive EO/IR target recognition systems. By FY02, demonstrate a field capability to locate, identify, and counter the adjunct (no existing capability). By FY04, perform captive-carry and live-fire tests to demonstrate a multi-function, EO/IRCM capability.

Achievement of this DTO will yield a baseline IR self-protection capability for rotary wing, tactical fighter and large airlift/transport/tanker class of slow-moving aircraft from existing and projected advanced IR missile threats. Current capabilities for such aircraft are little or no missile warning capability, augmented with limited capability, conventional flare technology. Benefit to the warfighter will be increased survivability, achieving over a 2X increase in effective jamming ranges, at affordable life-cycle cost. Added long term benefits of integrated EO/IRCM capabilities will be realized in EW effectiveness versus optical tracking and laser-designating/tracking threat functions.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	7.9	14.1	10.4	9.1	6.0	8.5

WE.04.04.CF. High Power Lasers For Theater Missile Defense. Develop and demonstrate technology for development of an operational high energy Airborne Laser (ABL) for Theater Missile Defense (TMD). Address risk reduction issues for development of the ABL Demonstrator and the subsequent development of an ABL system with full operational capability. Investigate and demonstrate atmospheric propagation over long horizontal paths with significant turbulence using advanced tracking and atmospheric compensation technology, and to reduce the weight of the chemical oxygen-iodine laser (COIL) devices for installation on aircraft which can meet TMD mission requirements. Specific demonstrations involve active tracking field tests against boosting missiles and ground testing of integrated atmospheric compensation and tracking, scaled to replicate the propagation conditions expected in a theater missile engagement scenario. The ABL technology objectives are to increase the atmospheric compensation and beam jitter strehl ratios (ratio of the beam intensity achieved compared to the ideal) by a factor of 2 and to increase the laser device efficiency by 10 - 20%. The ABL tracking, adaptive optics and laser device technologies pay off in performance growth and additional margin in the operational capability of the ABL weapon system. The Air Force separately funds the ABL System Program Office for demonstrator design and development to meet a FY02 subscale system demonstration. The ABL Technology Program will meet classified laser and optics performance milestones in FY97 for the ABL contractor downselect decision, in FY98 for demonstrator PDR, and in FY99 for demonstrator CDR.

In a parallel effort, develop and demonstrate Space-Based Laser (SBL) technology to support a system development decision for a multi-mission SBL (Theater Missile Defense, National Missile Defense, ASAT, Air Defense, and Surveillance). The previously demonstrated MW-class Alpha HF chemical laser, LAMP (Large Aperture Mirror Program) 4-meter segmented telescope, and LODE (Large Optics Demonstration Experiment) out-going wave beam control technologies will be integrated in the Alpha/LAMP Integration (ALI) demonstration to be completed in FY97. The High Altitude Balloon Experiment (HABE) will demonstrate at low power in the target environment a complete acquisition, tracking and pointing suite which is scaleable to SBL operational requirements. The primary remaining technical issues for SBL involve integration of hardware components into a light-weighted flight-ready configuration for final ground tests and an optional space flight/demonstration (SHIELD program), and integration of the target acquisition and tracking system which will be demonstrated in a separate integrated experiment (HABE program). LAMP and LODE technologies are currently being integrated in a vacuum chamber (for space simulation) adjacent to the current Alpha vacuum chamber. In FY97, ALI will demonstrate integrated generation, stabilization, and projection of a megawatt class high power laser beam. Critical parameters of beam quality, wavefront error, and jitter will achieve near weapon scale performance with power and aperture size (area) at 1/4 scale of an operational SBL system. Advanced technology demonstrations to double brightness, such as phase conjugation and operation at HF overtone will be conducted in FY99. An uncooled remotely aligned Alpha laser resonator will be completed in FY99 and tested in FY00.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	57.6	36.9	31.5	26.7	27.4	27.6

WE.05.02.F. Anti-Materiel Warhead Flight Test (AWFT). Demonstrate and integrate advanced LADAR sensor technology in combination with a multi-model warhead and advanced submunition airframe. Fabrication and integration tasks will be completed by mid FY98. Full-up flights tests of the submunition with sensor and multi-model warhead will be conducted in mid FY99. The goal of these flight tests is to discriminate targets with the LADAR sensor and successfully demonstrate warhead effectiveness when fired from a guided submunition. This supports the Anti-Materiel Munition (AMM) integration concept, and it encompasses technology which should mature in the FY00-FY05 timeframe. The program will demonstrate a key integration of a discriminating LADAR sensor to properly cue the warhead to function in the proper mode for optimum lethality. This combination of a sensor capable of discriminating a target and a warhead capable of multiple functioning modes and the synergistic benefit of marrying the two technologies represents a first in an autonomous submunition. The LOCAAS vehicle being used in AWFT improves munition effectiveness through a 5X increase in target search area, adverse weather operation, and a high kill probability for all anti-materiel targets. Sortie effectiveness is enhanced by enabling multiple kills/pass with the submunition/dispensing concept. The LOCAAS concept also has affordability as one of its' primary objectives, with a unit cost goal of $20K/submunition.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. Rose	Mr. James Chew	Lt Col Van Davis
Lethal SEAD SPO	DDR&E/AT	ACC/DRPW
DSN 872-4808	703-695-0005	DSN 574-7066

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	0.5	2.0	4.4	4.0	0.7	0.0

WE.06.02.N. Concentric Canister Launcher (CCL) ATD. Demonstrate, by FY99, the feasibility of a universal launching system employing concentric canisters. This can be applied to future Navy combat ships capable of firing a wide range of Missiles including ESSM, Tomahawk, STANDARD Missile Blk. 4, and the Army's ATACMS. Its lightweight structure and unique gas management system allows for inherently greater and more flexible firepower on a volume basis as compared to existing VLSA designs. The launching system is an array of concentric cylinders. The inner cylinder supports the weapon and guides its initial flight, while the annular space between the inner and outer cylinders provides for gas management during the launch sequence. The ability to design a concentric canister self-contained gas management system capable of successfully and safely handling both flyout and restrained firing of Tomahawk, STANDARD Missile Blk. 4, and ATACMS missiles will be demonstrated. This supports and provides greater firepower for naval combatants, lowers ship construction costs due to the establishment of a generic manufacturing process for all surface vessel weapon launchers, and eliminates a diversity of launcher types.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. David S. Siegel	Mr. James Chew	N86, SEA 0311,
ONR	DDR&E/AT	SC-21, CVX
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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	5.0	5.0	5.0	5.0	0.0	0.0

WE.07.02.A. Future Missile Technology Integration (FMTI) [Formerly TACAWS]. Demonstrate a technology base necessary to build a multi-platform, multi-target/multi-mission extended-range (beyond 7 Km) fire-and-forget missile which is compatible with the TOW and HELLFIRE family of launchers. Lock-on-after launch technology will be developed through special signal processing, advanced automatic target recognition, and man-in-the-loop (MITL) with an RF data link. Combined flexible capability allows one system or variants of one system to replace many, realizing potential extensive savings in development costs, logistics, training, etc. Particular attention will be given to the development of seeker technology capable of long range lock-on and defeat of helicopters buried in cluttered backgrounds, variable thrust smart propulsion allowing system range extension and thus standoff and high survivability, and the innovative use of RF data links for identification friend or foe, and the attack of targets masked from the launch platform. The missile system demonstration includes the integration of guidance, control, propulsion, airframe, and warhead technologies capable of performing in high clutter/obscurants, adverse weather environments and under countermeasure conditions. Demonstrated missile system performance (i.e.,; weight, range, kill ratio, speed, lethality) will be optimized to exceed current baseline parameters of ground-to-ground tube launched optically guided (TOW), ground-to-air STINGER, air-to-air STINGER, and Air-to-Ground Missile System (AGMS) in a size compatible with the TOW launcher. Demonstrate, by FY97, a lightweight, fire-and-forget, air-to-air, multi-role missile technology with a flight test of 5 missiles. The FMTI demonstration program will transition technology to the TOW Follow-on Engineering and Manufacturing Development (EMD) program beginning in FY96/97 and the Joint Advanced Weapons System (JAWS), an Army/Marine Corps multi-purpose, multi-platform missile. FMTI will permit the testing of the key JAWS technologies before committing to a Demonstration/Validation program. During FY98, will complete platform integration and fire control design leading up to a flight test from Helo and ground platforms of 8 to 10 safety certified/man-rate missiles with Soldier testing in FY01. This will provide an improved capability for defeating rotary and fixed wing aircraft in battlefield environments.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. Robert Reisman	Mr. James Chew	PM-TOW,
SARD-TT	DDR&E/AT	PEO-Tactical Missiles
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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	19.1	9.3	1.0	4.0	19.0	23.0

WE.08.02.F. Miniaturized Munition Technology (MMT) Guided Flight Tests. Demonstrate, by FY2002, the effectiveness of a small, 250 lb class munition with a general purpose warhead, an anti-jam GPS/INS guidance system, and a LADAR terminal seeker. The goal will be to demonstrate a small munition's capability to destroy a majority of the fixed target threats. Its small package will allow a 3-4 fold increase in aircraft loadout thereby increasing by 3-4 times the number of targets destroyed on a single sortie. Given a fixed number of aircraft, this will increase the tempo of the war and allow more targets to be destroyed in a shorter amount of time which has the potential to shorten the war. The smaller logistic footprint will allow airlifting of more munitions in a shorter amount of time. The smaller munition gives future aircraft designers more flexibility in sizing their weapons bays that drive the overall size of the aircraft.

The benefits will be demonstrated over 2 phases. The first phase will baseline small munition technology and runs from Sept 95 to June 97. During phase I, the following technologies will be demonstrated: (1) demonstrate a 250lb munitions ability to penetrate 6 feet of re-enforced concrete; (2) demonstrate that a 250lb munition is effective against 85% of the BLU-109 2010 fixed target threats; (3) demonstrate that a GPS/INS guidance, navigation, and control (GN&C) system with folding fins can be packaged to fit within a 6 inch diameter, 18 inch length; (4) demonstrate that the GN&C can control the airframe and meet terminal impact conditions of <1 degree angle of attack and > 80 degree impact angle; (5) demonstrate a GN&C accuracy of 3 meters excluding target location error using differential GPS/INS.

The second phase starts in FY98 and runs through FY02. During Phase II, the following technologies will be demonstrated: (1) demonstrate an enhanced fragmentation/enhanced blast warhead with an explosive 1.5 times the energy in tritonal; (2) demonstrate that the warhead in conjunction with the Hard Target Smart Fuze's (HTSF) ability to sense layers/voids can be detonated at the appropriate location to ensure the warheads effectiveness against 85% of the JDAM MK83/BLU-109 2010 fixed target threats; (3) demonstrate that an anti-jam GPS with a 120 db jam to signal ratio (50 db better than commercial systems) is effective up until 1 NMI from a 100k watt jammer; (4) demonstrate a less than 3 meter accuracy (400% improvement over JDAM accuracy) using a LADAR terminal seeker.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	7.0	2.0	0.1	2.5	3.0	3.0

WE.09.08.E: DARPA/Tri-Service IRCM Laser Technology. Develop, build and test diode-pumped solid state lasers with wavelength agility/diversity in the 2 to 5 micron (mm) spectral regions for tri-service IR countermeasures (IRCM) applications. By FY96, demonstrate two Phase I open-loop lasers with tunable output of 2-5 watts (W) per line in the 2-5 mm region, and which physically conform to 1.5 ft^3 and <50 pounds. By FY97, demonstrate two Phase II closed-loop systems with tunable output of 20 W per line (5-10 W minimum) at high repetition rates (20 kHz), and at less than 2 ft^3 and 150 pounds. Achievement of this DTO will enable the Services to implement critically needed IRCM capability, either open- or closed-loop design, in order to protect air, land and sea platforms from current and future heat seeking missiles.

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Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	3.5	3.5	0	0	0	0

WE.10.08.F. Ground-Based Laser ASAT. Develop and demonstrate GBL technology to support a system development decision for a GBL anti-satellite (ASAT) system. A central part of the effort is the Air Force's Integrated Beam Control Demonstration ATD, with parallel efforts in technology development for the chemical oxygen-iodine laser (COIL) device, high power optical components, and satellite vulnerability assessments. The ATD uses the 3.5 meter telescope at Starfire Optical Range and will demonstrate, at full scale but low power, weapons-class performance for all beam control functions associated with an end-to-end satellite engagement. The principle technology issues are 1) the demonstration of COIL technologies for thermal control and fluid recycling, to meet requirements for long run time and re-fire times between laser shots; 2) the development of scaled adaptive optics, laser beacon concepts/hardware, and control systems to meet atmospheric compensation performance goals for full-scale (3.5-4 meter) apertures, using laser beacon sensing of distortions due to atmospheric turbulence; 3) the development of laser illuminators and track sensors/processors to meet requirements for 24-hour active tracking of satellites to the required precision; and 4) the development of aimpoint designation and maintenance techniques to meet requirements for laser beam pointing. Primary metrics for this demonstration will be to atmospheric compensation performance, residual satellite tracking error, and laser beam pointing accuracy for aimpoint stabilization. Specific performance goals are classified, but they generally involve an improvement by factors of 2-4 over currently demonstrated capabilities at the subsystem level, as well as the simultaneous demonstration of improved performance for all subsystems in integrated testing. A series of increasingly-complex integrated beam control field tests will culminate in the final ATD demonstration in FY01. Intermediate results include the following: initial tracking of LEO satellites - FY97, install second-generation adaptive optics on 3.5 meter telescope - FY98, first integrated beam control tests against selected LEO satellites - FY99. Low power integrated beam control results will be extrapolated to high power through detailed simulation and performance analysis.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
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703-602-9200 x24	703-695-0005	715-554-5039
(DSN 332-)	(DSN 225-)	(DSN 692-)

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	17.0	14.0	13.5	12.6	10.4	10.5

WE.11.12.D. Advanced Unitary Penetrator (AUP). Demonstrate, by FY97, technology that will facilitate the near-term fielding of an improved warhead for weapons which currently employ the BLU-109 warhead (e.g., GBU-27, GBU-24A/B, and AGM-130). The goal is to demonstrate a warhead equipped with the Hard Target Smart Fuze (HTSF), which achieves 2-3 times the penetration of the BLU-109, without violating existing physical and functional interfaces between the warhead/guidance kit and weapon/aircraft; or adversely impacting the delivery conditions currently associated with the aforementioned weapon systems. The overall objective of the HTSF program, is to provide mature, demonstrated burst point control fuzing technology required to maximize the effectiveness of current and future penetrating warheads against a broad spectrum of hardened targets. Burst point optimization results in increased weapon effectiveness, reduced sortie rate regeneration and reduced collateral damage; while simultaneously reducing requirements for detailed target intelligence data. By 3QFY96, the HTSF: F-117/GBU27 flight test will be completed. By 1QFY97, the AUP Advanced Development and flight demonstration will be completed. The HTSP and AUP programs will also provide test articles for a follow-on flight demonstration to be conducted as part of the Counterproliferation Initiative's ACTD.

The new warhead design will employ a sub-caliber, high density penetrator to achieve the higher sectional pressures (i.e., Weight/Area) necessary for increased penetration. The AUP program will employ ultra-high density tungsten explosives to achieve the highest possible sectional pressures. The external dimensions, physical interfaces, and aerodynamic characteristics of the BLU-109 warhead will be maintained by placing the smaller diameter dense penetrator within a light weight aerodynamic shroud/faring, which is designed to serve as the interface between the aircraft/penetrator/standard guidance kit components. The AUP employment of the HTSF, will eliminate the current need for mission planners to precalculate the fuze's time delay, based on target intelligence data, this is often in error. Perfect knowledge of the target, perfect penetration predictions, and exact repeatability of impact conditions will no longer be required to achieve optimum results. The HTSF uses accelerometer-based technology which provides warhead detonation based on layer/void count, depth of burial, or backup electrically settable time delay. The HTSF is also being adapted for the large unitary penetrators such as the GBU-28 and the I-2000 (BLU-109/B). A smooth, low risk transition of the fuze to a streamlined Engineering Manufacturing Development (EMD) is being insured by concurrently addressing issues such as producibility, product assurance, human factors, manufacturing, environmental qualification testing and by the operational representative F-117/GBU-27 flight test during the Advance Development (6.3) program. The HTSF program will continue to mature this technology and reduce the overall risk for future inventory use and provide a demonstrated, producible, tactical baseline fuze.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
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SAF/AQT	DDR&E/AT	ASC/VX
703-746-8913	703-695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	6.3	4.3	0.0	0.0	0.0	0.0

WE.12.02.ANFH. Anti-Jam GPS/Inertial Competent Munitions. The purpose of this DTO is to develop and demonstrate a low cost, long range munition that provides an accuracy improvement of two orders of magnitude over current systems and is capable of successfully operating in a jamming environment. The product of this DTO is a jam resistant, integrated GPS/IMU navigation/guidance system munition that will be used by all services in both current and future munitions/projectiles including the Mk80 series "dumb " bombs, ground and naval artillery rounds, and the Joint Direct Attack Munition-JDAM. This is a joint Army, Navy, and Air Force program in which each service will focus on one of the three critical technical areas of the development: initial aiming and round registration, guidance/control and range extension, and anti-jam and JDAM integration.

The GPS/Inertial Competent Munitions program will develop an integrated GPS/IMU unit that will provide in-flight guidance, navigation and control with anti-jam capability in a form factor small enough to fit into a 9 in^3 NATO standard fuze-well. The small size of the unit will allow it to be used on the JDAM, which makes use of the 'dumb' bombs and projectiles thereby preserving the current investment while substantially increasing their accuracy. In the initial development phase a GPS translator will be used on the registration/spotting round to provide the warfighter accurate flight path data for calculating the fire control solution for the subsequent ordnance delivery rounds. The ordnance delivery rounds will be equipped with a GPS/IMU unit for guidance, navigation, and in-flight trajectory correction thereby reducing the average miss distance for a 30 kilometer shot from 250 meters to a few meters in a non-jamming environment. The anti-jam features of the unit will insure that the predicted level of accuracy can be maintained in a jamming environment. The GPS/IMU guidance unit will also be integrated with an improved delivery projectile capable of extending the range of the current Navy 5"/54 munitions from 30 out to 50+ miles thereby improving the range, accuracy, and effectiveness of Naval Surface Fire Support (NSFS) to the Marines in littoral operations.

Technology will be developed that will verify the Auto-registration capabilities of the GPS/Inertial Competent Munitions program. The Auto-registration effort will involve building a GPS translator unit capable of surviving a high-g launch environment. This GPS translator will be used to receive and relay the GPS navigation signals needed to track the trajectory and impact of the projectile thereby providing unobserved round registration and automated fire control correction. The ability to accurately determine the impact point of the spotting rounds provides a significant increase in the effectiveness of the subsequent ordnance delivery rounds. In FY96-98 the GPS/Inertial Competent Munitions program will demonstrate an operational system that implements a tracking projectile using GPS, predicts an impact point of the projectile, and then generates real time fire correction coordinates. This effort will also develop the technology required to enable the GPS/IMU to provide in-flight trajectory corrections of projectiles. This effort will directly feed in-flight guidance and control development work.

The GPS/Inertial Competent Munitions program consists of developing the technology to miniaturize the GPS/IMU to fit into a 9 in^3 volume and to utilize this guidance package to control the trajectory of the projectile in-flight and to increase the range of the weapons used for NSFS. The Navy will leverage the Army's work on inertial in-flight correction to develop the technology to change the trajectory of the munitions by adjusting control mechanisms based on position readings from the

GPS/IMU. By constantly monitoring actual versus planned trajectory, the unit can calculate the control inputs necessary to bring the munition back on trajectory and thereby reduce the average miss distance and increase the lethality of the munitions. Integrating the GPS/IMU in-flight guidance and control work with the technology required to increase the range and payload of the projectiles used for NSFS will be accomplished. Increasing the range and effectiveness of NSFS means more kills per round which translates into improved fire support for Marine operations from fewer NSFS assets. The range extension portion of the program will develop a high lift-to-drag, double ram composite projectile that is capable of delivering a 70 pound projectile at a distance of 50 or more miles. This program will leverage technologies from both the DNA composite projectile and the Army's HICAP programs.

The Anti-jam GPS Technology Flight Test (AGTFT) program will develop the technology to provide an anti-jam (AJ) capability for the GPS/IMU guidance system in order to maintain the current JDAM performance requirements in a jamming environment. The objective of the AGTFT program is to provide the best AJ capability for the lowest incremental cost with respect to the JDAM unit production cost ($72,000 unit by FY92 dollars). The AGTFT program is specifically tailored to address a JDAM PIP concern - GPS performance while being jammed. JDAM PIP is funding a portion of this program in order to ensure this concern is addressed. The AGTFT AJ Subsystem will undergo testing (FY96) to characterize both the AJ electronics functionality as well as the antenna patterns of the AGTFT four element-controlled radiation pattern antenna. The AJ subsystem will then be integrated into the AGTFT flight test vehicles (JDAM weapons) and ground tested (FY01). The flight tests will utilize a modified F-16 aircraft, and the launches will be performed in jamming environments. Flight testing is expected to be completed in early FY98 in order to meet the current JDAM PIP milestone schedule.

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703-695-0005

Customer POC:
ASC/YUJ, JDAM PIP
904-882-2961

XM-982 Projectile Pgm
201-724-4422

Naval Surface Fire Support
703-602-0418

Customer: N85, N865, NAVSEA PMS-429 (Naval Surface Fire Support Program Office - Extended Range Guided Munition Program (ERGM), PM-Paladin, PM-LW155, PEO-Field Artillery Systems.

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	16.2	22.7	19.7	13.0	6.9	0

WE.13.02.A. Counter Active Protection System (CAPS). Demonstrate, by FY98, a suite of technologies which, when applied to current and future Army anti-tank missiles, will neutralize the effectiveness of threat tanks equipped with any one of a variety of Active Protection Systems. Technology components of the Counter Active Protection System Suite are expected to include Electronic Countermeasures, advanced Long Standoff warheads, decoys and ballistic hardening countermeasures, RF electronic countermeasures, which will be demonstrated in a breadboard form by FY98 and in flight prototype FY99 and FY00. A variety of very long standoff warhead technologies will be demonstrated by FY98. This effort will neutralize the effectiveness of threat tanks equipped with any one of a variety of Active Protection Systems.

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703-695-0005

Customer POC:
CCAWS, AMS-H, JAVELIN, EFOG-M, BAT, and AGMS Systems.

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	1.5	4.2	5.0	4.2	0.5	0

WE.14.11.A. Munitions Survivability. In FY97, develop simulation and modeling to analyze logistics operations and evaluate the impact of proposed survivability technologies on the Distributed Interactive Simulation network. In FY98, develop and demonstrate technologies to provide enhanced sea based resupply and evaluate their impact on force projection. In FY99, demonstrate rapidly employed ammo protection systems. Demonstrate computer software incorporating state of the art explosives safety mitigation techniques to help soldiers better design survivable ammo storage areas. In FY00, demonstrate technologies that ensure survival and safe distribution of strategic and mission configured munitions loads. These logistics survivability improvements will provide early entry forces with a high assurance of mission success (70-90%) and will ensure that causalities are minimal (0-10%).

The Munitions Survivability program will develop technologies to improve the survivability of vulnerable munitions logistics nodes, to include airheads, ports and ammunition storage areas. Munitions survivability is obtained by (1) increasing munitions distribution velocity, (2) protecting munitions storage areas, and (3) developing systems to provide emergency resupply directly to forward fighting units.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. Robert Reisman	Mr. James Chew	Major Tim Raney
SARD-TT	DDR&E/AT	USA CASCOM
703-695-1447	703-695-0005	DSN 687-0486

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	1.0	2.9	2.8	4.7	6.2	0.0

WE.15.02.N. Low Cost Missile. Demonstrate, by FY99, a unique, finless, low drag (C_{DO} < 0.15 for frontal, skin and base), Bending Annular Missile Body (BAMB) missile airframe and ram-jet propulsion concept that will give the Navy the capability to attack time critical and hardened targets in a timely and affordable manner. In this concept, the ramjet combustor and tandem booster are connected to the frontal missile airframe by an articulating thrust vector control joint. The technical challenges that will be demonstrated by flight tests are a robust H-infinity based bending body control system to provide dynamically stable flight without aerodynamic control surfaces, a self starting annular inlet with 68% pressure recovery @M 3.0, 60K altitude and stable bent body combustion during maneuvers and all flight regimes. A free-flight test of a BAMB ram-jet missile configuration whose design to cost, excluding the warhead is $180K will be demonstrated by FY99. This provides the technologies necessary for a low cost ($180K) missile with a capability of 1000 NMI carrying a 500 lb warhead with a Block speed of M3.5. This average velocity will provide significantly reduced time-to-target (13min@ 500 nmi). Analysis shows that a weapon with this capability used in a Korean scenario would eliminate the need for over 240 aircraft sorties against time-urgent targets and buried targets all in high threat environments with a potential warfighting savings of over $250M.

The ATD addresses common deficiencies that exist in the Air Superiority and Defense Precision Strike Thrusts which require extended range, high-speed missile concepts. FASTHAWK will deliver weapon payloads to address the needs of the warfighter as defined in the “Joint Warfighting S&T Plan” and the individual Service requirements documents, including increased platform survivability, precision strike, low cost, longer range, and less visibility. FASTHAWK can be either surface-launched, subsurface-launched (ABL or VLS), or air-launched and would provide a common low-cost delivery platform. The supersonic velocity provided by the FASTHAWK missile will provide significantly reduced time-to-target (13 min @ 500 nmi) and provide increased maneuverability and range. These attributes will provide a supersonic, low-observable, high-energy payload delivery to fixed targets, including hardened targets, eliminating the need for precision delivery by aircraft. It will result in an increased launcher survivability with the resultant cost savings. These technologies are also applicable to other sized missile airframes including 12" diameter surface-to-air configurations with equivalent ranges and reduced target times. It will also significantly reduce maintenance costs (standardized off-the-shelf equipment and simpler systems) and logistics costs (S/F commonality). Technology in this ATD will transition to the Tomahawk Block 5 missile system. Major Area Defense programs which have indicated interest in this technology include Navy (PEO CU), PEO(TAD), AEGIS), Army (Corps SAM, Patriot), and Air Force. A letter of intent has been received from the Army at MICOM to jointly investigate this concept. Transition will be coordinated with block program efforts and with the technical POC for each program.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. David S. Siegel ONR 703-696-0554	Mr. James Chew DDR&E/AT 703-695-0005	N86, PEO(CU-PMA-280).

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	0	4.4	6.1	4.5	0	0

WE.16.05.A. Objective Individual Combat Weapon (OICW). Demonstrate, by FY99, affordable, high-payoff technologies that yield dramatically improved hit probability, lethality, and operational capability through use of air bursting munitions, kinetic energy projectiles and advanced fire control to determine operational utility and technological maturity. Technology components include: miniaturized electronic fuzing; miniature full solution fire control (laser range finder, ballistic computer, fuze setter, video day optics); dynamic damping; and light weight weapon mechanisms. This effort will provide a highly lethal and suppressive dual-munition weapon system that affects devastating target effects, defeats combat targets the M16 can not, increases the stand-off range, and permits a dramatic increase in the probability of incapacitation over the M16 and M16/M203 systems.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
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SARD-TT	DDR&E/AT	JSSAP
703-695-1447	703-695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	3.7	1.9	3.3	2.9	0	0

WE.17.02.F. Hammerhead. Demonstrate, by FY97, a Synthetic Aperture Radar (SAR) seeker which physically, electrically, and logically will integrate with a GBU-15 weapon to perform autonomous, precision guidance. Demonstrate, by FY99, a SAR-guided weapon which has an unlimited capability against targets obscured by clouds or fog, an infinite increase over existing laser designated munitions, and strikes the target to within 3 meters or less, a three-fold improvement over GPS/INS guidance systems. This demonstration will include the ability to attack targets with an angle of impact of 60 degrees or greater from the horizontal ground plane and an angle of attack of 5 degrees or less between the bomb velocity vector and the bomb roll axis. Mission planning will be accomplished by a trained operator in 15 minutes or less, a significant increase over current autonomous mission planning timeliness which can take days. The SAR seeker technology demonstrated under this program will allow operational commanders much greater flexibility in weapon employment since an enemy will not be able to hide in adverse weather conditions, whether natural or manmade. Response to time critical targets can be immediate. The precision guidance capability greatly reduces collateral damage to targets in heavily populated civilian areas and increases weapon lethality, thus requiring fewer aircraft sorties which reduces aircraft attrition. The autonomous capability improves shooter aircraft survivability through an increase in standoff range limited only by weapon kinematics, increases the aircraft's weapon capacity through the elimination of targeting or data link pods, and allows carriage on single seat aircraft by eliminating Man-in-the-Loop requirements. Producibility enhancements under considered have the potential to reduce seeker costs from $150k to less than $30k per unit, significantly improving weapon affordability. This will provide a revolutionary new air-to-surface precision guidance capability for adverse weather operations. This is required for the Air Force to fight and win future conflicts quickly with minimal resources and risks. Air Combat Command has stated the need for an adverse weather precision weapon delivery capability under MNS TAF-401-91.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
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SAF/AQT	DDR&E/AT	ASC OL/YUP
703-746-8913	703-695-0005	904-882-9583

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	4.9	5.0	3.0	3.0	0.0	0.0

WE.18.02.A. *Direct Fire Lethality*. Demonstrate, by FY97, a 120mm KE precursor penetrator to defeat the 2005 Explosive Reactive Armor (ERA) projected threat with an increase of 50% in lethality over the M829A2; statically demonstrate 120mm Smart Target Activated Fire and Forget (STAFF) dual liner Explosively Formed Penetrator (EFP) warhead function to form an ultra-long EFP, and demonstrate Smart Barrel Actuator active damping control of a XM291 120mm gun tube in non-firing, dynamic tests. In FY98, conduct a hardstand demonstration of Electric Direct Turret Drive (gearless) technology on an M1A1. Demonstrate, in FY99, an integrated 120mm KE Cartridge to defeat the 2005 ERA projected threat with 30% increase in system accuracy under stationary conditions over the M829A2/M1A2; demonstrate minimum 33% increase in armor defeat with a 120mm dual liner STAFF warhead; and demonstrate a 1Km increase in the effectiveness of the STAFF munition. Demonstrate, in FY00, a 300% increase (at 3Km) in probability of hit over the M1A2 under dynamic scenarios using Smart Barrel Actuators, Gearless Turret/Gun Direct Drives, and Modern Digital Servo Control. This will provide an integrated 120mm KE Cartridge to defeat the 2005 ERA projected threat with a 30% increase in system accuracy under stationary conditions over the M829A2/M1A2; a 33% increase in armor defeat with a 120mm dual liner STAFF warhead; and a 1Km increase in the effectiveness of the STAFF munition.

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Customer POC:
PM-TMAS,

PM-Abrams,

PEO-Armored Systems Modernization.

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	6.8	7.7	10.0	8.9	6.2	0

WE.19.08.F HPM/LASER Aircraft Self Protect Missile Countermeasures. Develop and demonstrate High Power Microwave (HPM) technology to provide robust protection against rapidly proliferating IR, EO, RF, and laser-guided munitions by disruption of seeker, guidance, and/or fuze electronics. Susceptibility data indicates that a high-average-power, ultra-wide-bandwidth (UWB) RF source can defeat present missile threats. Additional susceptibility data are required on advanced threat missiles and modeling and simulation tools must be developed to assess overall performance. The primary technical challenge is the development of a pod-mounted compact, high average power UWB source capable of providing self-protection against guided missiles for both fighters and large aircraft. This corresponds to a four-fold increase in source power and 50 percent reduction on antenna size. Required source performance will be demonstrated in FY97 and packaging compatible with a cable car will be completed in FY98. The Air Force plans a live fire demonstration in FY98-99 in conjunction with the DoD IRCM program in which a variety of missiles will be flown against the cable-car-mounted UWB source. The other significant technical challenge is reducing EMI/EMC problems with host aircraft. Necessary EM hardening technology will be developed and demonstrated.

In a parallel effort, develop and demonstrate laser system technologies for a disrupt/destroy (D2) laser weapon to counter the next generation IR-guided SAM and AAM threats. Applies moderate-power laser device and beam control technology to demonstrate a robust capability to negate IR-guided missiles by degrading/destroying the IR seeker. The FY99 demonstration will be conducted initially against live-fire missiles, flown against a cable-car mounted laser system. Demonstrate by FY01 a D2 IRCM prototype laser/beam control system on a large aircraft platform. This program will be a coordinated Army/Navy/Air Force effort to address self-protection for large aircraft and helicopters against shoulder- and air-launched IR missiles. This will provide a more robust IR countermeasure than conventional jamming but requires a higher power laser and necessary effects database. Also develop by FY01 Fotofighter laser technology by combining technology development for semiconductor laser diodes, coherent laser diode array architectures, and electronic beam steering into demonstration of moderate- to high-power laser systems which can be constructed as conformal arrays of phased, electronically steerable diode lasers in the skin of an advanced aircraft. This demonstration will establish the technology for low drag, compact, high efficiency laser weapons for use in both offensive and defensive roles. Fotofighter provides an all-aspect capability for air-to-air and air-to-surface engagements. Technology advancements needed include wide-angle beam steering, high power thermal control of laser arrays, and wavelength versatile semiconductor laser materials. The criterion for success is demonstration of a building block, kilowatt-class phased array laser module for scaling to multi-kilowatt applications. Demonstrate by FY05 kilowatt-level short wavelength phased laser arrays. Demonstrate by FY06 100 Watt infrared phased laser arrays. This will be a coordinated Air Force/Navy effort.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
LtCol John Haynes SAF/AQT 703-602-9200 x24 DSN: 332-	Dr. Stan Gontarek DDR&E/AT 703-695-0005 DSN: 225-	LtCol Caslen AMC/DR 618-256-3908 LtCol Tom Bucklin ACC/DRF 804/764-7490

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	18.5	18.3	21.5	21.0	13.2	14.5

WE.20.02.AF. Non-Lethal Program. The Non Lethal Program is separated into the following areas: Acoustics, Kinetics, Entanglements, Vehicle Stopper and Riot Control Agents. The goal is to develop, demonstrate and expedite fielding of anti-personnel and anti-materiel non lethal devices, munitions and weapons. This Program has been structured to address the following Military applications: Seize Building(s), Defend an Area, Block an Area, Conduct (and provide for) Tactical Movement, Control Access to an Area, Seize Person/Personnel and Seize Equipment/Vehicle. Related Law Enforcement activities include: Hostage/Barricade Situations, Riot/Crowd Control, Close Proximity Encounters, Fleeing Suspects and Intruder Prevention. The primary focus of the demonstrations is to make near term non lethal technologies available for Soldier testing.

Key Demos:
FY96-
- A Combustion Driven Pulsed Acoustic Device will be demonstrated.

FY97-
- Acoustic bio-effects activities continue with the goal of acoustic device testing by the Soldier
- A downselect (conducted by Soldier live firings) will take place from amongst 40mm (M203), Muzzle Launched Ordnance (M16A2) and 12 gauge blunt impact non-penetrating munitions.
- A non lethal Claymore mine which dispenses rubber “sting” balls will be demonstrated.
- An anti-personnel entanglement munition fired from an 40mm (M203) will be demonstrated.
- Also being pursued is Speed Bump, a pre-emplaced remotely activated vehicle stopper, ready for demonstration in FY97.
- A Volcano mine dispensed concertina wire demonstration will take place in FY97 for use as both an anti-personnel and anti-materiel barrier.
- In Riot Control Agents, a Mid-sized dispenser test item will be available for Soldier test.

FY98-
- A variable velocity barrel is also being pursued for demonstration in FY98.

Svc/Agency POC:
Mr. Robert Reisman
SARD-TT
703-695-1447

MGen Richard Paul
AFMC/ST
513-257-3344
DSN 787-3344

USD(A&T) POC:
Mr. James Chew
DDR&E/AT
703-695-0005

Dr. George Schneiter

Customer POC:
AF Security Police
Maj Mike Pasquin, AF/SPX,
DSN 224-8644;

AF Space Command Col Barlow;

AF Special Operations Command;
and ARDEC Mr. Harry Moore,
DSN 880-6398

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	1.0	1.0	1.0	0.9	0.9	0.9

WE.21.02.NE. Fiber Optic Gyro Based Navigation Systems. Demonstrate, by FY99, technologies for a new generation of affordable and reliable navigation units. The goals of the DARPA GPS Guidance Package (GGP) Program are to develop, mature, and integrate solid state technologies for affordable, precise navigation. The GGP tightly integrates a miniature GPS receiver (MGR) with an all solid state, low cost, navigation grade, miniature inertial measurement unit (MIMU) and advanced navigation computer. The 12-channel MGR will process the GPS Precise Positioning Service code signals and will track all satellites in view. The MIMU features navigation grade interferometric fiber optic gyroscopes (IFOGS) and solid state accelerometers. Unaided inertial navigation can be provided to $\leq$1 nmi/hr. Navigation accuracy of $\leq$20 meters can be maintained after loss of GPS signals for four minutes. The MGR and MIMU are tightly coupled. The MGR aids the MIMU, for example, during in-flight alignment. Conversely, the MIMU aids the MGR in reacquisition of GPS signals after periods of signal outage. Phase 1 of the program produced two fully operational brassboard units. These units were demonstrated on an Army M981 tracked vehicle at Redstone Arsenal, Al, in June 1995. They will be demonstrated on a F/A-18 in early summer 1996. Phase 2 of the program was initiated in June 1995. Phase 2 goals place more stressing demands on performance of the IFOGS and accelerometers and further reduces volume (100 cu in), weight (7lb), and power (25W) of integrated GGP units. The production cost goal, for Phase 2 GGP, is $15,000 for 3000 units. The Naval Air Systems Command and DARPA have signed a memorandum of agreement for test and transition of Phase 2 units as the next generation, embedded GPS inertial navigation. Beside airborne platforms, GGP has an application in a variety of ground vehicles, standoff weapons, ballistic air-to-surface weapons and surface-to-surface missiles.

An alternate approach for a miniaturized IMU being pursued by the Navy, the Precision Strike Navigator, will be demonstrated, by FY98. Using advanced polymer on silicon technology, a low cost ($2K/axis), 1 NM/hr (inertial grade), hybrid fiber optic gyro (FOG) based inertial measurement unit (IMU) chip, containing the accelerometer, FOG optics and all of the IMU electronics will be demonstrated. The fiber coil is external to the chip. It provides a potential low cost miniature inertial grade IMU whose projected cost is $6K (based on 100,000 unit production volume) for a complete 3-axis IMU. This IMU could then be integrated with a miniaturized GPS receiver.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Maj. Beth Kaspar DARPA 703-696-2369	Mr. James Chew DDR&E/AT 703-695-0005	Capt F. G. Schnobert NAVAIR/PMA-209 703-607-3509
Mr. David S. Siegel ONR 703-696-0554		Common Avionics Office (NAVAIR PMA-209),
		FIST V Program Office,
		Army Missile Systems & JAST Program Office for GGP, N88, PMA-201
		JSOW Program Office for Precision Strike Navigation

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	13.9	14.0	19.5	21.6	11.1	28.0

WE.22.09.F. High Power Microwave C2W/IW Technology. Develop and demonstrate High Power Microwave (HPM) technology to disrupt, degrade and destroy electronics in information systems and communication links. With minimal intelligence HPM weapons can potentially defeat a wide variety of targets while producing low collateral damage. The key challenge is determination of the irradiation parameters necessary to defeat key classes of targets and incorporation of those data into models for assessment of effectiveness and extrapolation to other targets. In FY99 sufficient understanding of target vulnerabilities will have been acquired to focus high power wideband source development on parameters required for specific ATDs. Requirements include compact high peak (damage) and high average (disruption) power UWB sources, and packaging for an air-deliverable bomb (damage), submunition (disruption), and/or unmanned aerial vehicle. Technology for first generation weapons will be developed in a logical sequence starting with man portable or ground mobile weapons, followed by airborne weapons on UAVs or munitions, and finally, in the far term, space-based weapons. Source RF output, size and reliability will be advanced to support ATDs planned to begin in FY01. This is a coordinated Air Force, Navy and Army effort.

In parallel, develop and demonstrate HPM technology for suppression of enemy air defense (SEAD) applications. Objectives include permanent damage of integrated air defense systems electronics. First step is determination of lethality parameters to defeat a wide range of targets. Primary technical challenge is development of a compact, high peak power narrowband HPM source with pulse energy sufficient to destroy system electronics within the required target irradiation area. Single or multiple pulses are required dependent on platform and mission scenarios. Substantial advancement in both pulse power (factor of two increase in efficiency) and RF source technology (factor of five in pulse energy) is needed, as well as technology to extract high power RF from a small platform. Air Force plans to demonstrate explosively-powered, single pulse device compatible with bomb delivery in FY99 and multi-pulse device compatible with UAV in FY03.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
LtCol John Haynes	Dr. Stan Gontarek	CAPT. James R. Powell
SAF/AQT	DDR&E/AT	JCS/J38
703-602-9200 x24 (DSN 332-)	703-695-0005	703-695-3330
	(DSN 225-)	(DSN 225-)

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	13.5	13.1	13.4	16.9	21.0	21.2

WE.23.08.ANF. Modern Network Command and Control Warfare (C2W) Technology. Develop and demonstrate a capability to intercept and attack/counter advanced, global, military communications networks from ground and airborne platforms. By FY98, demonstrate unmanned aerial vehicle (UAV)-based electronic support (ES) and real-time relay to ground and air components of the Integrated EW Common Sensor (IEWCS) system. By FY00, demonstrate ES and electronic attack (EA) strategies to counter Types 1, 2 and 3 complex communication formats, and demonstrate a ten-fold increase in HF wideband power generation in a comparable package volume; and by FY06, 1000X improvement in effective use of available transmitter power, and a 1000X improvement in EA spatial selectivity for jamming strategies. Achievement of this DTO will enable joint forces to wage a proactive, offensive information warfare (IW) against an enemy's command and control infrastructure and delay/deny effective enemy defense versus US/coalition strike forces.

Svc/Agency POC:
LtCol John Haynes
SAF/AQT
703-602-9200

Dr. P. Grounds
ONR-313
703-696-0561

Mr. Robert Reisman
HQDA
703-695-1447

USD(A&T) POC:
Dr. Stan Gontarek
703-695-0005

Customer POC:
Classified (AF)
PO-IEW (Army)

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	7.4	5.9	6.2	8.4	5.1	3.3

WE.24.08.ANF. Sensor Fusion/Integrated Situation Assessment Technology. Develop and demonstrate off-board, all-source information correlation ("fusion") with on-board multi-spectral receiver/sensor information, and advanced emitter identification algorithms, to yield platform self-defense at long interdiction/strike ranges, enhanced combat identification (ID), and dynamic route replanning/retargeting. By FY97, conduct flight tests of retrofit subsystem to demonstrate 10X improvement in RF emitter geo-location and real-time specific emitter ID (SEI); and demonstrate enhanced IEW asset management and integrated preparation of the battle field tools and techniques. By FY98, demonstrate multiple source fusion by using terrain reasoning tools and techniques and moving target indicator (MTI) automated tracking. By FY99, demonstrate advanced airborne planning algorithms and integrate into the Army's IEWCS multi-sensor tasking and reporting tools; demonstrate 100X increased processor throughput capability based upon COTS, real-time symmetric multi-processing (RTSMP) technology; and as a result, demonstrate a net 3-4X acceleration of automated, en route correlation of all available off-board/on-board information regarding threat emitter laydown, mission tasking, precision targeting, and platform response/ resource management. By FY02, demonstrate integrated RF/IR/Laser sensor, processing and countermeasures suite size reductions of up to 50%, with an attendant 200% increase in MTBF. Achievement of this DTO will result in real-time "situation awareness" for which there is limited-to-no operational baseline capability re single/limited-seat tactical platforms (air/ground). This DTO achieves initial "real time information in the cockpit (RTIC)" capability and real-time, bi-directional/C^3I mission information (real time "out" of the cockpit -- RTOC) for Joint Commander assessments and digital replanning/retargeting.

Svc/Agency POC:
Mr. Robert Reisman
HQDA
703-695-1447

LtCol John Haynes
SAF/AQT
703-602-9200

Dr. P. Grounds
ONR-313
703-696-0561

USD(A&T) POC:
Dr. Stan Gontarek
703-695-0005

Customer POC:
Maj Holland
HQ ACC

Lt Col Kemerer
HQ AFSOC
PMA-272

Col. Roy Oler
PM-AEC
314-263-5527

Mr. Bernie McDowell
PMSW
540-349-6809

Dr. Ray Freeman
PMIF
703-285-8086

Ms. Silva Rivero
PM-ASI
810-574-7763

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	19.7	20.2	17.2	17.1	13.1	11.2

WE.25.02.A. Multimode Air Frame Technology Demonstration (formerly LONGFOG). Demonstrate, by FY98, a system through modeling, simulation, and flight testing, which will provide a 40 Km day/night, MLRS Family of Missiles (MFOM) compatible, multiple and high value time-sensitive point-target strike capability while inflicting minimum collateral damage. Hardware design will be completed in FY96 (Critical Design Review). The LONGFOG system will provide the capability to select priority targets after launch, conduct limited man-in-the-loop BDA, and provide target area reconnaissance in addition to target attack by means of variable cruise velocity over areas of interest. These capabilities will be achieved by means of integrated GPS and inertial navigation, variable threat air-breathing propulsion, composite material airframe providing low IR signature and low RCS, variable geometry wings, imaging IR seeker, and other appropriate technologies. This 6.2 technology effort supports and provides the capability to select priority targets after launch, conduct limited man-in-the-loop BDA, and provide target area reconnaissance in addition to target attack by means of variable cruise velocity over areas of interest.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. Robert Reisman	Mr. James Chew	PEO-Tactical Missiles, Field
SARD-TT	DDR&E/AT	Artillery
703-695-1447	703-695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	3.4	3.6	1.2	0	0	0

WE.26.02.N. Cruise Missile Real-Time Retargeting. Develop technologies for brilliant autonomous cruise missiles that have onboard mission planning and control systems. Demonstrate, by FY00, a brassboard real-time guidance and control system with an associated LADAR sensor and with associated mission planning to demonstrate distributed guidance technology needed to provide (1) immediate launch on coordinates capability for weapons, (2) in-flight, onboard decision making to provide in-flight coordinated attack against fixed and mobile targets including the ability to switch alternative targets given information by either external or internal sources that an individual cruise missile's primary target has been damaged or destroyed by a preceding cruise missile, (3) precise aim point selection, and (4) Battle Damage indication. The Laser Radar (LADAR) Seeker that will be demonstrated in this program is being developed jointly with the Air Force and is anticipated to cost 10% of the imaging IR systems currently deployed. Provides greater than 33% reduction in future cruise missile seeker/G&C systems cost. In-flight, onboard route re-planning capability and onboard real-time autonomous decision making capability will reduce the number of cruise missiles per target by a factor of a third and thus reduce the over-all life cycle costs of future cruise missile systems.

Svc/Agency POC:
Mr. David S. Siegel
ONR
703-696-0554

USD(A&T) POC:
Mr. James Chew
DDR&E/AT
703-695-0005

Customer POC:
N86, PEO
(CU-PMA-280)

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	5.0	5.7	5.5	6.1	4.5	0

WE.27.02.N. Concurrently Engineered Ball-Joint Gimbal Imagery Seeker. Demonstrate, by FY99, via captive carry flight testing an integrated set of high-risk seeker subsystem technologies and concepts designed to reduce the throw-away cost of strike weapon systems by 35%-50%. Specifically, this effort will focus on developing and demonstrating a innovative ball-joint gimbal concept; integrating and demonstrating an affordable “industry standard” large field-of-view (FOV) staring IR focal plane array (IRFPA) with the ball-joint gimbal by leveraging advanced technology developed under the DARPA IRFPA Flexible Manufacturing Program and applying Design for Manufacturability and Assembly (DFMA) processes couple with engineering computer automated design (CAD) systems. The estimated resource savings from this program is $35K to $55K reduction in the unit cost of an IR Strike seeker. This cost savings is based on a $110K estimated cost for a current IR seeker. Based on future JSOW and Tomahawk inventory objectives, the potential exists to save over $400M using the technologies demonstrated under this ATD.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. David S. Siegel	Mr. James Chew	N88, PMA-201 (JSOW Program
ONR	DDR&E/AT	Office), PMA-280.
703-696-0554	703-695-0005	

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	2.0	3.7	4.9	4.2	0	0

WE.28.02.A. Low Cost Precision Kill (LCPK) Technology Demonstration. Demonstrate, by FY01 a low cost, precision guided 2.75 inch rocket that provides a stand-off surgical strike capability against specific non-heavy armored targets. Provide low collateral damage while providing a 4-fold increase in kills per number of rounds expended. Applications include AH-64 Comanche, OH-58D Kiowa, Warrior, SOF, Avenger, Bradley, HMMWV, LAV-AD, and RFPI. Key milestones are: FY98 - Demonstrate through laboratory tests and a hardware-in-the-loop (HWIL) simulation, the feasibility of the guidance concept. The increase in lethality provided by this concept will result in a 2/3 reduction in cost per kill with respect to the unguided 2.75 inch rocket.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. Robert Reisman	Mr. James Chew	Army Aviation
SARD-TT	DDR&E/AT	(Apache AH-64).
703-695-1447	703-695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	0.5	1.2	1.2	0	0	0

WE.29.02.N. Anti-Torpedo Torpedo ATD. Demonstrate, by FY99, Anti-Torpedo Torpedo (ATT) homing and fuzing which can be incorporated into existing and planned torpedo and Submarine Defensive Warfare Systems (SDWS). The effort is to embed ATT homing and fuzing technology developed in the 6.2 program in a prototype guidance system and demonstrate performance against torpedo targets in clean, CM, salvo, ship wake, and shallow water environments. The technologies to be demonstrated include high range resolution-high repetition waveforms, high pulse rate signal and image processing, adaptive CM processing, integrated homing and fuzing, acoustic intercept receiver, data fusion, and torpedo defense specific tactics. Surface ships and submarines need a hardkill torpedo defense capability to ensure their survivability in future conflicts. Fewer ships will be operating in littoral waters and will encounter an emerging threat posed by the proliferation of modern, quite, capable, diesel-electric submarines armed with modern, lethal weapons. Moreover, many of these encounters will be close-in and will demand quick reaction. This ATD will develop and demonstrate new hardkill torpedo defense homing and fuzing technology based on common hardware and software which is compatible with existing and future torpedo systems - 21 inch, 12.75 inch, and 6.25 inch diameters. These technologies will be inserted (with minimal impacts) into existing operational torpedo inventories, and their stockpile-to-target systems, to quickly provide significant and cost-effective warfighting capabilities.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Mr. Floyd Reeser	Mr. James Chew	Capt Murphy
ONR	DDR&E/AT	N863E
703-696-0989	703-695-0005	703-695-2369

N86, Lightweight Hybrid Torpedo (LHT), MK48 ADCAP and Submarine Defensive Warfare Systems Program.

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	--	4.0	5.0	5.0	0.0	0.0

WE.30.08.N. Advanced Electronic Countermeasures (ECM) Transmitter For Ship Self Defense. Develop and demonstrate an ECM transmitter and a preferential acquisition decoy that is fully escapable of engaging modern threat weapon systems from surveillance/targeting phases through terminal run-in phase of an anti-ship missile. It will produce a fieldable brassboard ECM system which produces the required transmit beams over a full angular sector of 90^o azimuth by 50^o elevation. Transmitted power will be on the order of one mega watt. It will be able to demonstrate operation in coordination with the Eager decoy system. This system will consist of a planar array of dual polarized flared notch elements, a power amplification network, a beamforming network, a switching and distribution network and the Eager preferential acquisition decoy. In FY96, the ECM transmitter will be defined and hardware acquired. The Eager decoy will be fabricated and flight tested. In FY97, fabrication and subsystem testing will be completed and the Eager decoy will be tested on land and a final demonstration performed. In FY98, system integration, testing and final demonstration of the ECM transmitter will be completed. FY99 systems will be available for coordinated testing as an integral part of the shipboard ECM suite and results of coordinated testing could be used as requirements for the Advanced Integrated ECM System (AIEWS) if desired.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
Dr. P. Grounds	Dr. S. Gontarek	CDR W. Haggard
703-696-0561	703-697-0005	703-695-2081

Programmed DTO Funding ($M):

	FY96	**FY97**	**FY98**	**FY99**	**FY00**	**FY01**
Total	8.5	10.0	4.0	0.0	0.0	0.0

WE.31.02.N. Explosive Ordnance Disposal (EOD). Develop technology to increase standoff capability for detection and examination and render safe of Unexploded Ordnance (UXO) to increase the safety of the Joint Service EOD Technicians. By FY96 increase underwater examination capability in cloudy water conditions from 1 foot to 15 feet. By FY97 decrease operational cost of MK16 Underwater Breathing Apparatus (UBA) by 25%. By FY98 decrease size and cost of laser neutralization of surface munitions by 50%. By FY99 increase buried UXO detection capability by 50%. By FY01 reduce signature of EOD tools and equipment by 50% and In-situ disposal of explosive materials.

Svc/Agency POC:	USD(A&T) POC:	Customer POC:
ADM Yount	Mr. James Chew	ASD(SO/LIC) H&RA
Naval Ordnance Center	DDR&E/AT	DoD EOD Program Board
301-743-6754	703-695-0005	

Programmed DTO Funding ($M):

	FY96	FY97	FY98	FY99	FY00	FY01
Total	5.0	5.2	5.2	5.2	5.2	5.3

A. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION AND ADVANCED TECHNOLOGY DEMONSTRATION PROGRAM SUMMARIES FOR INFORMATION SUPERIORITY

A. INFORMATION SUPERIORITY

INTEGRATED COLLECTION MANAGEMENT ACTD

OBJECTIVE:

THE OBJECTIVE IS TO DEVELOP AN ACTD WHICH WOULD DEMONSTRATE INTEGRATED COLLECTION MANAGEMENT OF SIGINT AND IMINT NATIONAL AND THEATER SENSORS TO OPTIMIZE COLLECTION FOR THEATER NEEDS.

JUSTIFICATION:

ABIS ACTD QUAD CHART BEING FORMULATED

SCHEDULE AND FUNDING:

MILESTONE	FY97	FY98	FY99	FY00
	8.0	9.0	7.0	

APPROACH:

- MISSION PLANNING OPTIMIZATION BETWEEN NAVIGATIONAL ROUTE CHANGES VS SENSOR POINTING CHANGES
- MISSION PLANNING ADDRESSING TIMING/TASK EXECUTION OPTIMIZATION (I.E., FULFILLING A RECONNAISSANCE TASK NOW BY CHANGING ROUTES VS FULFILLING THE TASK ON SUCCESSIVE ORBITS BY ADDING HIGH PRIORITY SENSOR TASKS).

APPLICATIONS:

- INTEGRATED TASKING OF AIRBORNE AND NATIONAL ASSETS
- INTEGRATED 24-HOUR PLANNING ACROSS MULTIPLE SENSORS AND MULTIPLE ROUTES
- SENSOR/STRIKE INTEGRATION FOR TIME COORDINATED BDA

INTEGRATED COLLECTION MANAGEMENT ACTD DECISION CRITERIA

OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
	ABIS DECISION CRITERIA BEING FORMULATED		

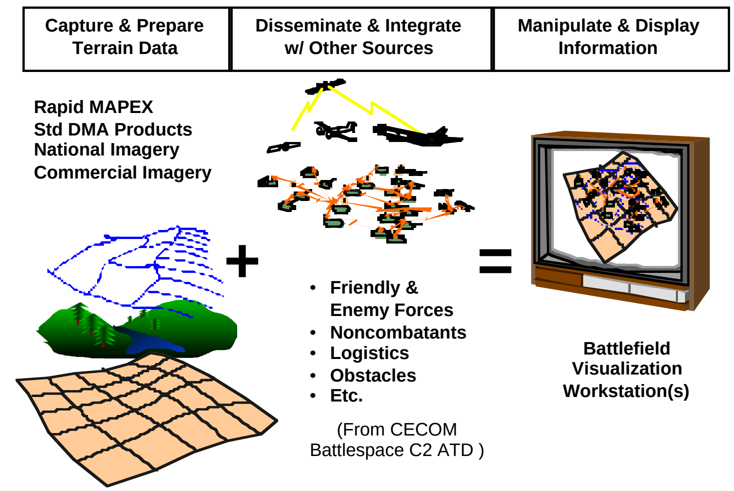
RAPID BATTLEFIELD VISUALIZATION ATD (PROPOSED ACTD)

OBJECTIVE:

- INTEGRATE TECHNOLOGIES FOR RAPID, HIGH RESOLUTION DIGITAL TERRAIN DATA (DTD) GENERATION, DISSEMINATION, AND DISPLAY/UTILIZATION.
- DEMONSTRATE DTD MERGED WITH INTEL DATA AS FOUNDATION FOR BATTLEFIELD VISUALIZATION.

JUSTIFICATION:

- EMERGING CAPABILITIES MUST BE INTEGRATED TO ENSURE AVAILABILITY OF CRITICAL TERRAIN DATA TO WARFIGHTER.
- ARMY DOES NOT HAVE HIGH RESOLUTION DIGITAL TERRAIN DATA NEEDED FOR MISSION PLANNING AND EXECUTION WORLDWIDE.
- CAPABILITY TO INTEGRATE TERRAIN DATA WITH INTEL AND SITUATIONAL AWARENESS DATA IS LIMITED.



SCHEDULE AND FUNDING:

MILESTONE	FY97	FY98	FY99	FY00
•IFSAR – FLIGHT/DEMO – ENHANCE PROC				
•AUTO FEATURE DATA – BASELINE DEMOS – HI-RES FEATURES				
•EXPLOIT EMERGING DTD SOURCES				
•USER SUPPORT – RAPID MAPEX – XVII ABN CORPS				
•DEMO @ AWEs	TFXXI	DIV AWE	CORPS AWE	CORPS/ TF AWE
FUNDING ($ MILLIONS)	9.9	12.4	16.9	16.1

APPROACH:

- DEMONSTRATE RAPID GENERATION OF DIGITAL TOPOGRAPHIC DATA (DTD) TO SUPPORT FORCE PROJECTION TIMELINES (EARLY ENTRY)
- INTEGRATE DTD WITH INTELLIGENCE AND SITUATIONAL AWARENESS DATA FROM BC2 ATD.
- USE EXISTING AND EMERGING WIDEBAND ELECTRONIC COMMUNICATIONS TO DISSEMINATE DATA TO USERS.
- DEMONSTRATE/INTEGRATE IFSAR CAPABILITIES TO PRODUCT HIGH RESOLUTION ELEVATION DATA.
- INTEGRATE SEMI-AUTOMATED FEATURE EXTRACTION CAPABILITIES TO PROVIDE RAPID FEATURE DATA FOR CONTINGENCY OPERATIONS.

APPLICATIONS:

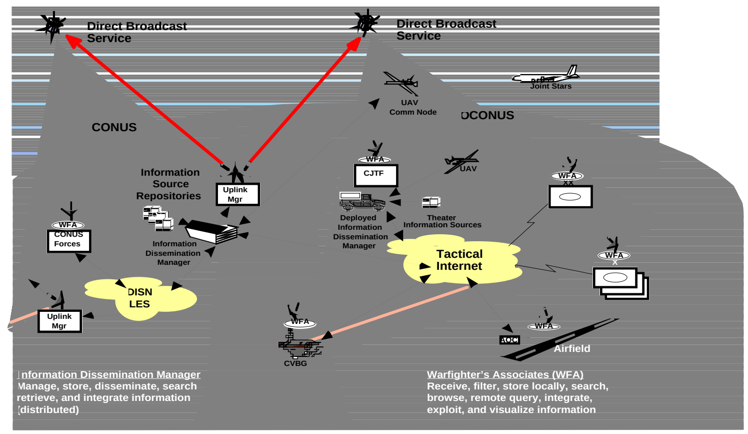
ABCS, TEM, DTSS, CCTT, BVIS-ACTD

RAPID BATTLEFIELD VISUALIZATION ATD (PROPOSED ACTD) DECISION CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
• COLLECTION MANAGEMENT	• DE-CENTRALIZED, MANUAL	• SEMI-AUTOMATED PROCESS	• INTEGRATED AND AUTOMATED PROCESS
• ELEVATION DATA GENERATION	• DMA, CARTO SOURCE, DTED LEVEL I (100m) & II (30m)	• IMAGE OR IFSAR SOURCE, MULTI-RES, LEVEL III (10m)	• MIL PLATFORM IFSAR OR IMAGE SOURCE, TAILORED RES, LEVEL V (1m)
• FEATURE DATA GENERATION	• DMA, CART SOURCE, ITD, LABOR INTENSIVE	• IMAGE SOURCE, SEMI-AUTOMATED, LIMITED FEATURE CONTENT	• ANY SOURCE, SEMI-AUTOMATED, ITD-LIKE FEATURE CONTENT
• SPATIAL DATA MANAGEMENT	• NO CURRENT CAPABILITY FOR MULTI-RES, MULTI-SCALE	• HIERARCHICAL DATABASE FOR FINITE SET OF RESOLUTIONS & SCALES	• FLEXIBLE HIERARCHICAL DATABASE FOR MULTI-RES, MULTI-SCALES
• DATA TRANSFORM FOR C2 & MISSION PLANNING SYSTEMS	• MANUAL, ONE-AT-A-TIME FOR NON-DMA COMPLIANT SYSTEMS	• AUTOMATED FOR ONE BV SYSTEM	• AUTOMATED FOR SUITE OF BV SYSTEMS
• DATA DISSEMINATION	• MAG TAPE OR CD-ROM	• NEAR-REAL-TIME ELECTRONIC, COTS	• NEAR-REAL-TIME ELECTRONIC, MILITARY
• DATA DISPLAY/USE	• 2-D CAPABILITY, LIMITED 3-D	• 3-D MISSION PLANNING ON COTS PORTABLE WORKSTATION	• BV CAPABILITY ON MULTI-PLATFORMS, MULTI-APPS

BATTLEFIELD AWARENESS AND DATA DISSEMINATION (BADD) ACTD

OBJECTIVE:

- INSTALL AND EVALUATE AN OPERATIONAL SYSTEM THAT ALLOWS COMMANDERS TO DESIGN THEIR OWN INFORMATION SYSTEM; DELIVERS TO WARFIGHTERS AN ACCURATE, TIMELY, AND CONSISTENT PICTURE OF THE JOINT/COALITION BATTLEFIELD; AND PROVIDES ACCESS TO KEY TRANSMISSION MECHANISMS AND WORLDWIDE DATA REPOSITORIES



PLAN/MILESTONES/FUNDING:

Initial Information Dissemination Manager (IDS) and Warfighter Associate (WFA) to 2nd Armored Division	06/96
Demonstrate Initial BADD Capability	11/96
Support Task Force XXI AWE	02/97
BADD Pilot Service in CONUS	08/97
Support Operational Exercise OCONUS & CONUS Upgrade	07/98
BADD Pilot Service OCONUS	09/98
UAV Communications Relay Demonstration	03/99
Final Operational Services	09/00

FUNDING (ALL SOURCES) ($M)

FY96	FY97	FY98	FY99	FY00
17.2	35.6	54.0	56.9	22.0

TECHNICAL APPROACH:

- ALLOWS COMMANDERS TO DESIGN/TAILOR THEIR OWN INFORMATION SYSTEM
- INTELLIGENT PUSH AND PULL OF INFORMATION
- CONSISTENT PICTURE OF THE BATTLESPACE
- QUERY CAPABILITY FOR WARFIGHTER
- ENABLE TOTAL BATTLEFIELD AWARENESS
- BROADCAST INFORMATION SERVICES INSTEAD OF POINT-TO-POINT DATA DELIVERY
- TRANSITION DEPLOYED WARFIGHTER ASSOCIATES (WFA) AND INFORMATION DISSEMINATION MANAGERS (IDM) TO USACOM AND OCONUS CINC
- TRANSITION APPLICATIONS TO DISA AND GBS PO

BATTLEFIELD AWARENESS AND DATA DISSEMINATION (BADD) ACTD PROVISIONAL DECISION CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**IMPROVEMENT**	**GOAL**
COMMUNICATE INFORMATION TO REQUIRED CUSTOMER LEVELS	STOVEPIPE AND SOME CROSSFLOW OF INFORMATION SYSTEMS	ACCESS INFORMATION ACROSS MANY PARALLEL SYSTEMS	SEAMLESS INFORMATION ACCESS
ACCESS ARCHIEVED INFORMATION ON FRIENDLY AND ADVERSARY FORCES	ARCHIEVAL ACCESS ONE AT A TIME	TERABYTE ACCESS ON DEMAND	NEAR-REAL-TIME TERABYTE ACCESS

GEODSS UPGRADE ACTD

OBJECTIVES:

- DEMONSTRATE ABILITY TO ELIMINATE A MAJOR SPACE SURVEILLANCE GAP WITH A LOWER COST, MORE CAPABLE, AND ACCURATE TRANSPORTABLE SYSTEM.

JUSTIFICATION:

- FIRST STEP TOWARD MEETING UNFILLED DEEP SPACE SURVEILLANCE NEED.

NOT AVAILABLE

SCHEDULE:

- CONUS DEMO—SOCORRO NM—NOV 95–FEB 97
- DEPLOY OCONUS—AUG 97

FUNDING (Budget and POM):

MILESTONE	FY94+	FY95	FY96	FY97
AF 3600	13.5	0.2	3.2	0.6
OSD/AT	0	0	0	TBD

TECHNOLOGY:

- CHARGED COUPLE DEVICE SENSOR (DETECTS 10X DIMMER OBJECTS)
- SIGNAL PROCESSOR (HIGHER ACCURACY, 2X FASTER SEARCH AND TRACK)

PLAYERS:

- HQ AFSPC, ESC, SM/ALC, AFOTEC
- TRW

STATUS:

- CONTRACT AWARDED—SEP 93
- CONUS DEMO IN PROGRESS
- SEARCH AND TRACK DEMONSTRATED—JAN 96

GEODSS UPGRADE ACTD PROVISIONAL DECISION CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
NOT WORLD BASED WITH SIGNIFICANT GAPS	FILL PACIFIC AND ATLANTIC GAPS		IMPROVE VISIBILITY BY 10X, OBSERVATIONS BY 2X

UNATTENDED GROUND SENSOR ACTD

OBJECTIVES:
- ENHANCED TACTICAL USE OF UGS
- MONITORING OF LINES OF COMMUNICATION AND CHOKE POINT AREAS
- BDA
- EASE OF USE

JUSTIFICATION:
- PROVIDES TIMELY, HIGH QUALITY ISR, REAL-TIME FUSED BATTLESPACE PICTURE, AUTOMATIC TARGET RECOGNITION, AND BDA.
- REAL-TIME ISR TASKING.

NOT AVAILABLE

SCHEDULE:
- FY97 START—3 YEAR DURATION

STATUS:
- IN PLANNING
- WEATHER STATION
- BRIEFED TO DUSD/AT

FUNDING (ESTIMATED):

MILESTONE	FY97	FY98	FY99
AGENCIES DUSD/AT	13.0	12.0	12.0

TECHNOLOGY:
- EMPLACED SENSORS
  - ACOUSTIC, SEISMIC, MAGNETIC
  - WEATHER, IMAGING, CHEMICAL, ETC.
- RELIABLE COMM
- WORKSTATIONS

PLAYERS:
- DARPA, CMO, ARMY, AIR FORCE, MARINES, USSOCOM
- USCENTCOM, USSOCOM

UNATTENDED GROUND SENSOR PROVISIONAL DECISION CRITERIA		
OPERATIONAL CAPABILITY	**BASELINE**	**GOAL**
UGS PROVIDES SPECIALIZED AND TAILORED INDICATORS OF PRESENCE OR ABSENCE	UGS INTEGRATED INTO COHERENT ENSEMBLE OF BATTLE SENSORS	ADD DIMENSIONS OF SENSING IN MINIATURE/ THROWAWAY (COST EFFECTIVE) DEVICES FOR BROAD SPECTRUM SENSING

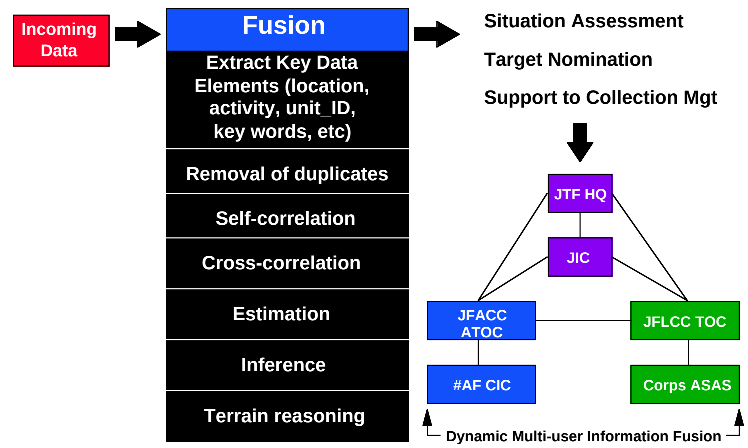
OPERATOR INTELLIGENCE INTERFACE ACTD

OBJECTIVE:

- OPERATIONAL
  - – EVALUATE EFFECTIVENESS IMPROVEMENT OF REAL TIME, DYNAMIC INTEL DISPLAY TO WARFIGHTER.
- TECHNICAL
  - – INTEGRATION OF RED AND BLUE FORCE DATA
  - – CORRELATION OF INTEL FEEDS
  - – 1000:1 COMPRESSION FROM INPUT DATA TO DISPLAYED SITUATION.

JUSTIFICATION:

- ELEVATES UNDERSTANDING OF ENEMY, FRIENDS, AND GEOSPATIAL SITUATION.
- SUPPORTS DATA FUSION AND PRESENTATION, REAL-TIME REPLANNING, AND SITUATIONAL ASSESSMENT.



SCHEDULE:

FY96: TRANSITION SIGINT CORRELATION TO ARMY

FY97: STAND-UP INTERIM SYSTEM AT CENTCOM FOR TCT TRACKING VALIDATED REFERENCE ARCHITECTURE AND FORCE MODEL

FY98: STAND-UP SYSTEM AT EUCOM (DISTRIBUTED AT MULTIPLE NODES) AND DEMONSTRATE COMPLETE BATTLEFIELD AWARENESS

FY99: UPGRADE DEPLOYED CAPABILITIES

FUNDING:

MILESTONE	FY97	FY98	FY99	FY00
UNDER DEVELOPMENT				

TECHNOLOGY:

- SOFTWARE FOR:
  - – INTEGRATION OF INTELLIGENCE CORRELATION, TERRAIN FEATURE GENERATION AND TOP SIGHT HERITAGE TECHNOLOGIES
  - – VARIABLE GRANULARLY DISPLAY OF FORCE DISPOSITION
  - – SITUATION ASSESSMENT AND PROJECTION
  - – PRESENTATION OF REAL TIME UPDATE/MODIFICATION OF INTEL ESTIMATES

PLAYERS:

- ARPA
- PROVISIONAL: CENTCOM AND EUCOM

OPERATOR INTELLIGENCE INTERFACE ACTD DECISION CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
CANDIDATE ACTD—DECISION CRITERIA NOT AVAILABLE			

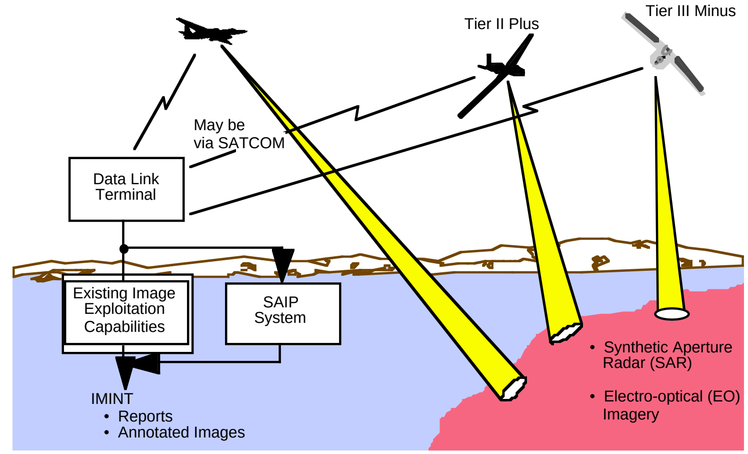
SEMI-AUTOMATED IMINT PROCESSING ACTD

OBJECTIVES:

- DEMONSTRATE A WIDE AREA BATTLEFIELD SURVEILLANCE CAPABILITY
- ADDRESS HIGH DATA RATE REQUIREMENTS OF HAE UAV/U-2
- PROVIDE AN IA FORCE MULTIPLIER THROUGH AUTOMATION AND INTERACTIVE TOOLS

APPROACH:

- INTEGRATE TARGET AND FORCE RECOGNITION TOOLS INTO A SINGLE EXPLOITATION VAN TO SUPPORT U-2R AND HAE UAV OPERATIONS



SCHEDULE:

- **AUGUST 1996**

  LABORATORY DEMONSTRATION OF SYSTEM
- **NOVEMBER 1996**

  STAND-UP EXPLOITATION VAN AT EDWARDS AFB FOR USER EVALUATION
- **FEBRUARY 1997**

  OPERATIONAL DEMONSTRATION AT NT**C**
- **MAY 1997**

  OPERATIONAL DEMONSTRATION AT ROVING SAND**S**
- **JULY 1997**

  INITIAL OCONUS OPERATIONS

TECHNOLOGY:

- AIRBORNE COLLECTORS SYSTEMS
  - U-2R (ASAR-2 AND UPGRADES), TIER II+, TIER III-
- EXPLOITATION SOFTWARE
  - OBJECT-LEVEL CHANGE DETECTION
  - ATR FOR OBJECT RECOGNITION
  - INTERACTIVE TARGET RECOGNITION
  - FORCE STRUCTURE AND TERRAIN ANALYSIS
  - SITE MODELING AND MONITORING
  - COLLECTION TASKING
  - MULTIMEDIA DISSEMINATION
- EXPLOITATION WORKSTATION
  - 60+ SILICON GRAPHICS CPUs
  - USER DEFINED HCI

SEMI-AUTOMATED IMINT DECISION CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**

CANDIDATE ACTD—DECISION CRITERIA NOT AVAILABLE

HIGH ALTITUDE ENDURANCE UAV ACTD

OBJECTIVES:

- 14 AIR VEHICLES, MIX OF LO AND CONVENTIONAL
- WIDE AREA/SPOT-ALL WX
- DIRECT WARFIGHTER CONTROL
- REAL TIME, HIGH QUALITY IMAGERY
- ACQ STREAMLINING EXPERIMENT
  —ARPA NON-FAR AGREEMENT
  —$10M UFP DESIGN TO COST

NOT AVAILABLE

PLAYERS:

- **CINC USACOM**
- **ARPA/USN/USAF/USA JPO**
- **DARO ACTD FUNDING**

SCHEDULE:

- **VLO UAV FLIGHT TEST—OCT 95**
- **CONV UAV FLIGHT TEST—JAN 97**
- **ACTD USER DEMOs—97-99**

TECHNOLOGY MIX:

- VLO TREATMENTS
- AUTOMATIC FLIGHT CONTROL
- >40-HOUR ENDURANCE, JET POWERED
- COMMERCIAL MANUFACTURING PROCESSES
- >10 GFLOP AIRBORNE PROCESSOR
- LOW COST SAR/MTI/EO/IR SENSORS
- WIDEBAND SATCOM

HIGH ALTITUDE ENDURANCE UAV ACTD PROVISIONAL DECISION CRITERIA

OPERATIONAL CAPABILITY	**BASELINE**	**GOAL**
WIDE AREA COVERAGE NOT ASSURED	ASSURE 100 PERCENT OF WIDE AREA AND SELECTED SPOTS ARE COVERED	REAL TIME, HIGH QUALITY IMAGERY WITH >10 GFLOP AIRBORNE INFORMATION PROCESSING

MEDIUM ALTITUDE ENDURANCE UAV ACTD

OBJECTIVES: • DIRECT CONTROL/TASKING BY JFC • PROVIDE NEAR-TERM CAPABILITY • CUED LONG DWELL RECON/SURVEILLANCE • ALL WX/DAY/NIGHT IMAGERY • LOW COST, ATTRITABLE	NOT AVAILABLE
PLAYERS: • **CINC USACOM AND COMPONENTS** • **JOINT STAFF** • **UAV/JPO** ***SCHEDULE:*** • **ROVING SANDS—JUL-SEP 95** • **OVERSEAS DEPLOYMENT—MAR-NOV 96** • **RESIDUAL CAPABILITY—FY96-98**	***TECHNOLOGY:*** • OFF-THE-SHELF SYSTEMS INTEGRATION • 1 FT IPR SAR • WIDEBAND SATCOM ***RESIDUALS:*** • 10 UAVs, 3 GROUND STATIONS • C4I INTEGRATION • TRAINED OPERATORS

MEDIUM ALTITUDE ENDURANCE UAV ACTD PROVISIONAL DECISION CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
UAV COVERAGE IN COMBAT THEATER DIRECT CONTROL BY JFC	NEAR TERM ALL WEATHER/ DAY/NIGHT IMAGERY		LOW COST ATTRITABLE VEHICLES PROVIDING 100 PERCENT OF ON-CALL REAL TIME COVERAGE

SMALLSAT SAR ACTD

OBJECTIVES:

- PROVIDE TACTICAL SAR IMAGERY FROM SPACE (NO OVERFLIGHT AND MINIMAL IN-THEATER SUPPORT)
- INTERNATIONAL COOPERATION
  - JOINT DEVELOPMENT
  - JOINT USE INTEL COLLECTION

JUSTIFICATION:

- RAPIDLY AVAILABLE ANY PLACE ON EARTH
- HIGH QUALITY ISR FOR COMMON OPERATIONAL PICTURE

NOTE: THIS CANDIDATE ACTD IS NO LONGER BEING CONSIDERED.

SCHEDULE:

- FY97 START—5 YEAR DURATION

STATUS:

- IN PLANNING

FUNDING:

MILESTONE	FY97	FY98	FY99	FY00	FY01
AGENCIES FOREIGN DUSD/AT	UNDER DEVELOPMENT				

TECHNOLOGY:

- SYNTHETIC APERTURE RADAR
  - 1M GSD, STRIP MAP
  - DIRECT DOWNLINK
- PROCESSING (ONBOARD OR IN THEATER)

PLAYERS:

- DUSD/SPACE
- NRO, ARPA, AF
- GERMANS, FRENCH
- USEUCOM, USSPACECOM

SMALLSAT SAR ACTD PROVISIONAL DECISION CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
SMALL SATELLITE SYNTHETIC APERTURE RADAR	1 METER STRIP MAP ON CALL	JOINT/ALLIED USE SAR IMAGERY USING MINIMUM THEATER SUPPORT	TACTICAL SAR IMAGERY ON CALL FOR UNITED STATES OR ALLIES WITH ONBOARD PROCESSING

WIDE AREA TRACKING SYSTEM (WATS) ACTD

OBJECTIVES:

- DEMONSTRATE CAPABILITY TO AUTOMATICALLY DETECT AND PROVIDE WARNING/RESPONSE TO VEHICLE DELIVERED NUCLEAR THREATS TO TYPICAL AIRBASE OR PORT FACILITIES BY 1998.

JUSTIFICATION:

- MEET STATED NEED (U.S. FORCES KOREA).
- ENHANCED ABILITY TO IDENTIFY AND TRACK TARGETS.
- SUPPORTS REAL-TIME PLANNING, RE-TARGETING, AND COORDINATION OF FORCES.

NOT AVAILABLE

SCHEDULE:

- FIELD TRIALS—AUTOMATION/RF LINK FY97
- INSTALLATION/DEMONSTRATION—FY98

STATUS:

- IN PLANNING—DESIRE DOE SUPPORT
- SINCE SIGNIFICANT DIFFERENCE FROM BIO, SEPARATE ACTD, BUT WITH INTEGRATED COMMS/DISPLAYS

FUNDING (ROM):

MILESTONE	FY97	FY98	FY99	FY00
DOE (NN-20)	0.5	0.5	0.5	0.5
SERVICE				
OSD/AT	0.25	0.25	0.25	0.25

TECHNOLOGY:

- EXISTING NUCLEAR DETECTORS INTEGRATED INTO C4I/ WARNING SYSTEM/DISPLAYS

PLAYERS:

- USFK, PACOM
- LLNL, DOE, JPO-BIO DEF, TBD

WIDE AREA TRACKING SYSTEM (WATS) ACTD PROVISIONAL EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
DETECT CARRIERS OF NUCLEAR WEAPONS FROM SPACE	PROVIDE WARNING AND COVERAGE FOR USFK ASSETS AND INFRASTRUCTURE	PROVIDE WARNING OF PENDING DELIVERY OF NUCLEAR WEAPONS	INTEGRATE WATS INTO C4I/ WARNING SYSTEMS/ DISPLAYS

COUNTER CAMOUFLAGE, CONCEALMENT, AND DECEPTION (PROPOSED ACTD)

OBJECTIVES:

- AREA DELIMITED DETECTION OF TARGETS IN CC&D USING:
  - FOLIAGE PENETRATION (FOPEN) UWB RADAR
  - HYPERSPECTRAL IMAGING SENSOR
- COMPLEMENT TO AND USE OF UAV ALL WEATHER, WIDE AREA SURVEILLANCE (WAS) IMAGE EXPLOITATION SYSTEMS
- REAL TIME, ONBOARD IMAGE PROCESSING
- LEVERAGE DARPA/DARO ADVANCED TECHNOLOGY DEVELOPMENT PROGRAMS

JUSTIFICATION:

- PROVIDES COMMON SITUATION ASSESSMENT BY AUTOMATING SENSOR DATA FUSION
- REAL-TIME DETECTION, ID, MONITORING, AND BDA

NOT AVAILABLE

SCHEDULE:

• ACTD CONCEPT DEFINITION	FY96
• HSI ON PREDATOR DEMO	FY96
• REAL TIME PROCESSOR DEMO	FY97
• AB DEMO FLIGHT INTEGRATION	FY98
• UAV FOPEN/HSIR FLIGHT TEST	FY99
• ACTD USER DEMOS	FY99-00

FUNDING:

	FY95	FY96	FY97	FY98	FY99	FY00	TOTAL
ACTD	--	--	TBD*	TBD*	TBD*	TBD*	

*NOT IN POM

TECHNOLOGY MIX:

- MAE/HAE UAV PLATFORMS
- ULTRA-WIDEBAND (UWB) VHF/UHF FOPEN RADAR
- EO/IR HYPERSPECTRAL IMAGER
- >60 GFLOP AIRBORNE PROCESSOR
- AUTOMATED TARGET DETECTION AND CUEING

PLAYERS:

- CINCEUR, SOUTHCOM
- DARPA/USAF/USA/USN
- DARO

COUNTER CAMOUFLAGE, CONCEALMENT, AND DECEPTION (PROPOSED ACTD) PROVISIONAL DECISION CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
FOLIAGE/CAMOUFLAGE OBSCURES AND CONCEALS REAL WORLD TARGETS	ADVANCED SENSORS PENETRATE USING VHF OR UHF RADAR AND HYPERSPECTRAL IMAGING	PENETRATE ANY DENSITY OF FOLIAGE/CAMOUFLAGE	COMPREHENSIVE COVERAGE WITH COUNTER CC&D RADAR WITH REAL TIME ONBOARD PROCESSING DEMONSTRATED

GLOBAL GRID TACTICAL FIBER ACTD

OBJECTIVES:

- THREE-PHASE PROGRAM
  - PHASE I FOCUS ON RAPID CABLE LAYING TO NEAR SHORE ENVIRONMENT AND PROVIDING WET CONNECT I/F
  - PHASE II FOCUS ON HIGH SPEED LITTORAL DEPLOYMENT ONTO SHORE
  - PHASE III FOCUS ON EXPANDING TACTICAL INTERFACES ASHORE

JUSTIFICATION:

- TIMELY, CONSISTENT GLOBAL DISSEMINATION OF DATA TO SUPPORT A COMMON SITUATIONAL ASSESSMENT AND DECISION MAKING

NOT AVAILABLE

SCHEDULE:

- FY97 START—THREE YEAR DURATION

STATUS:

- IN PLANNING—GOAL TO LEVERAGE $4.8M IN PBD 871

FUNDING (ROM):

	FY97	FY98	FY99	FY00	FY01
DISA ASD/C3I OSD/AI	4.8* 1 1	TO BE DETERMINED			

*ONLY FY97 FUNDS EXIST/IDENTIFIED.

TECHNOLOGY:

- EXISTING UNDERSEA CABLE LAYING EQUIPMENT/FIBER, MODIFIED LCAC FOR LITTORAL DEPLOYMENT, TACTICAL FIBER INTERFACE/COMMS INTERCONNECT

PLAYERS:

- EUCOM, PACOM, CENTCOM, ACOM—TBD
- DISA JIEO, ASD/C3I, MARINES—TBD

GLOBAL GRID TACTICAL FIBER PROVISIONAL ACTD DECISION CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**IMPROVEMENT**	**GOAL**
RAPID RESPONSE FIBER OPTIC NETWORK FOR TACTICAL EMPLOYMENT	FIBER OPTIC CABLE LAYING IN NEAR SHORE ENVIRONMENT	SUPPORT LITTORAL INSERTION WITH RAPID NEAR SHORE CABLE DEPLOYMENT	EXPANDED TACTICAL INTERFACES ASHORE

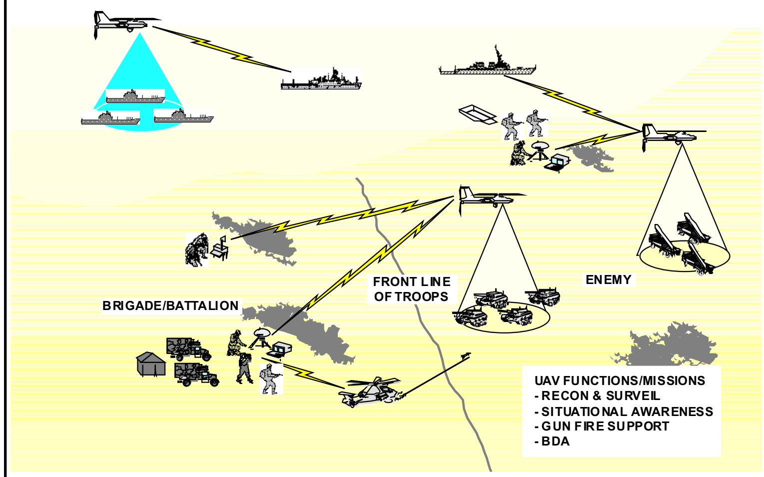
JOINT TACTICAL UAV ACTD

OBJECTIVE:

THE TUAV MUST PROVIDE THE ARMY BRIGADE, USMC MARINE AIR GROUND TASK FORCE, AND NAVY COMMANDERS WITH A *DEDICATED* UNMANNED AERIAL VEHICLE SYSTEM THAT DELIVERS TIMELY, ACCURATE, AND COMPLETE *TARGETING* AND OTHER *BATTLEFIELD INFORMATION* TO THEIR UNITS IN NEAR-REAL TIME (I.E., MILITARY UTILITY).

JUSTIFICATION:

- PROVIDE TACTICAL UNITS WITH RESPONSIVE CAPABILITY TO CONDUCT NEAR-REAL TIME BSTA IN AREAS THAT
  - — CONTAIN UNSUPPRESSED ENEMY AIR DEFENSES
  - — ARE HEAVILY DEFENDED
  - — ARE OPEN OCEAN ENVIRONMENTS
  - — ARE CONTAMINATED.
- DECREASE RISK TO HIGH-COST MANNED SYSTEMS.



SCHEDULE AND FUNDING:

	FY96		FY97				FY98	
	3QTR	4QTR	1QTR	2QTR	3QTR	4QTR	1QTR	2QTR
CONTRACT AWARD	Δ							
OPTION AWARD	→							
FIRST FLIGHT			Δ					
SYSTEM DELIVERIES					Δ1 Δ2	Δ3	Δ4 Δ5	Δ6
EXERCISES						⟝		
SHIPBOARD DEMO							⟝	⟞
INTEROPERABILITY DEMO								⟝⟞

APPROACH:

- COST AS AN INDEPENDENT VARIABLE = THE COST OF THE 33RD AIR VEHICLE WITH PAYLOAD MUST NOT EXCEED $350K, AND THE COST OF THE 100TH AIR VEHICLE WITH PAYLOAD MUST NOT EXCEED $300K.
- COME "AS CLOSE AS POSSIBLE" TO MEETING BASIC PERFORMANCE REQUIREMENTS =
  - — RANGE: 200 KM
  - — TARGET LOCATION ERROR: NTE 100m
  - — ENDURANCE: 3 HRS
  - — LAUNCH AND RECOVERY: UNPREPARED SURFACE/ LARGE DECK AMPHIBIOUS SHIPS
  - — SYSTEM MOBILITY: 2 HMMWV/1 TRAILER
  - — SYSTEM DEPLOYABILITY: SINGLE C-130
  - — PAYLOAD: EO/IR
  - — INTEGRATION: EMI SHIELDING/CORROSION INHIBITION
  - — DATA LINK: COMPLIANT WITH JII

APPLICATIONS:

- RECONNAISSANCE AND SURVEILLANCE
- SITUATIONAL AWARENESS
- GUN FIRE SUPPORT
- BOMB DAMAGE ASSESSMENT (BDA)

JOINT TACTICAL UAV PROVISIONAL DECISION CRITERIA

PARAMETER	**BASIC**	**OPTION**
RANGE	200 km	
TARGET LOCATION ERROR	BEST POSSIBLE USING STATE-OF-THE-ART GPS (NOT TO EXCEED 100 m)	
ON-STATION ENDURANCE	3 HRS	4 HRS
LAUNCH AND RECOVERY	UNPREPARED SURFACE/LARGE DECK AMPHIBIOUS SHIPS	ADD AUTOMATIC TAKEOFF AND LANDING
SYSTEM MOBILITY	2 HMMWV/1 TRAILER	
SYSTEM DEPLOYABILITY	SINGLE C-130 (4 A/V AND GROUND EQUIPMENT)	
PAYLOAD	EO/IR	SAR
INTEGRATION	EMI SHIELDING/CORROSION INHIBITION	
DATA LINK	COMPLIANT WITH JII (200 km LOS AT SEA LEVEL)	COMMON DATA LINK
PROPULSION SYSTEM	AS PROVIDED BY CONTRACTOR	HEAVY FUEL ENGINE
COST	$350K @ 33rd AND $300K @ 100th A/V AND SENSOR	

DIGITAL BATTLEFIELD COMMUNICATIONS ATD

TACTICAL COMMUNICATIONS FOR THE WARRIOR

OBJECTIVE:

DEMONSTRATE A SECURE, ROBUST, SEAMLESS, DIGITAL, MULTIMEDIA, INFORMATION TRANSPORT CAPABILITY FOR THE ARMY TACTICAL USER THAT IS COMPLIANT WITH AND EXPLOITS EMERGING COMMERCIAL STANDARDS AND THE DISN ARCHITECTURE.

JUSTIFICATION:

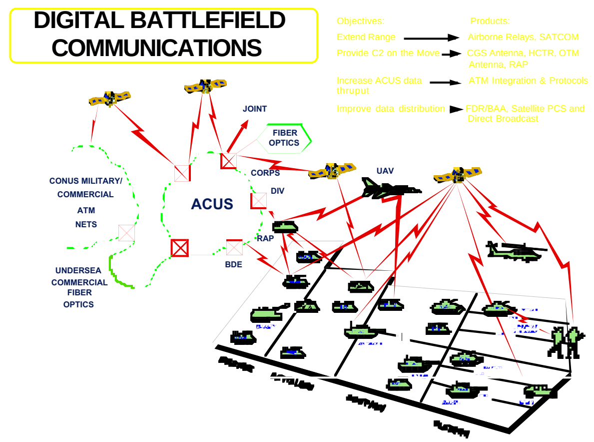
- SATISFIES "INFORMATION PULL" REQUIRED BY THE WARFIGHTER OF THE NEXT DECADE
- RESOLVES CURRENT COMMUNICATION DEFICIENCIES OF LIMITED BANDWIDTHS, MOBILITY, RANGE, AND INTEROPERABILITY
- PROVIDES ACCESS WHENEVER, AND WHEREVER NEEDED, TO LARGE VOLUMES OF IMAGERY, INTELLIGENCE AND LOGISTICS DATA NECESSARY TO SUPPORT SPLIT OPERATIONS

BATTLELAB:

- BATTLE COMMAND

PEO:

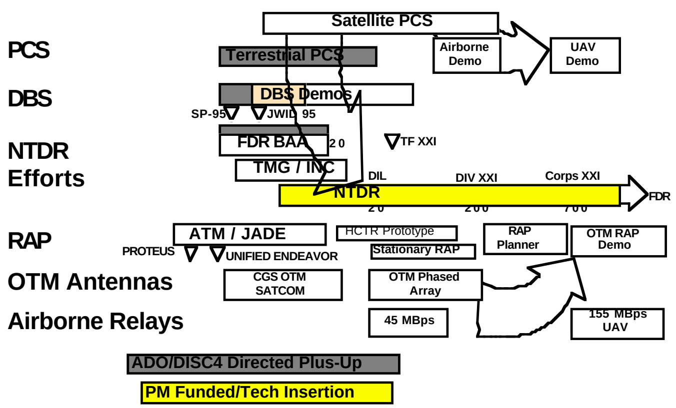
- COMM
- CCS



SCHEDULE AND FUNDING:

DBC / BITS Product Evolution

FUNDING ($K) (FY)	8381	14899	18104	12984	11786
	95	96	97	98	99



APPROACH:

- DEVELOP & INTEGRATE A SERIES OF TECHNOLOGIES TO SUPPORT THE DIGITIZED BATTLEFIELD
  - WIDEBAND MOBILE DIGITAL RADIOS
  - WIDEBAND OTH HIGH CAPACITY TRUNK RADIOS (HCTR)
  - MOBILE COMMUNICATIONS (CNR, SATCOM)
  - RANGE EXTENSION (SATCOM, UAV)
  - NEW SERVICES (DBS, SAT PCS)
- ALLOW EVOLUTIONARY GROWTH FROM TODAY'S SYSTEMS TO SUPPORT INTERFACE TO COMMERCIAL ATM INFRASTRUCTURE/ GLOBAL COMM/DISN
- ESTABLISH JOINT TESTBED EXPERIMENTS WITH BCBL(G) AND OTHER SERVICE LABS
  - SUPPORT ADO CAMPAIGN PLAN BY INJECTING TECHNOLOGY INTO TF, DIV, CORPS XXI
  - INCREMENTAL PRODUCT INSERTION INTO BATTLE LABS/AWEs
- MODELING AND SIMULATION TO DEFINE AND EVALUATE ALTERNATIVE CONCEPTS
- UTILIZE CAC2 AND BC2 AS FEEDER APPLICATIONS

APPLICATIONS:

- FORCE XXI BITS
- ARMY COMMUNICATIONS AT ALL ECHELONS

DIGITAL BATTLEFIELD COMMUNICATIONS ATD EXIT CRITERIA

TECHNOLOGY	CURRENT CAPABILITY	MINIMUM EXIT CRITERIA	GOAL EXIT CRITERIA
SATCOM OTM	STEERED UHF YAGI LIMITED COMMERCIAL	LOW PROFILE UHF COMMERCIAL OTM EXPLOIT COMMERCIAL SAT PCS IMPROVED DSCS	OTM DSCS MILITARIZED SAT PCS WIDEBAND RAP OTM SATCOM
RADIO ACCESS POINT (RAP)	NONE	WIDEBAND SWITCHING 45MBps TRUNK RADIO USE EXISTING RADIOS	ATM SWITCHING 45-155 MBps OTM TRUNK MBMR
RANGE EXTENSION	UHF SURROGATE SATCOM	45MBps AIRCRAFT RELAY OTM TRUNK TO AIRCRAFT	155MBps AIRCRAFT RELAY 45MBps UAV OTM
MODELING & SIMULATION	MSE SPM (INCL CONNECTIVITY MODEL) CAC2 SPM DIS-COMPLIANT SINCGARS RADIO	EXTEND SPMs TO INCLUDE SIP, EPLRS DATA HOTSPOT ANALYSIS WIDEBAND DATA RADIO MODEL WIDEBAND TRUNK RADIO MODEL RAP MODEL	DIS-COMPLIANT ARCHITECTURE ANALYSIS TOOLS REAL TIME OTM NETWORK PLANNING TOOLS

BATTLESPACE COMMAND AND CONTROL ATD

The emphasis of the Battlespace C2 ATD (BC2) is on the Cdr's and the Digital Battle Staffs' information and visualization requirements, consistent with Joint Initiatives.

The objective is to develop, integrate, and refine information and knowledge base technologies and systems into:

(a) A Digital Battle Staff's Battlefield Visualization Capability with integrated Decision Spt

- **Tactical Picture & Situation Assessment**
- **Planning & Resource Allocation**
- **Dynamic Execution Management & Mission Rehearsal**

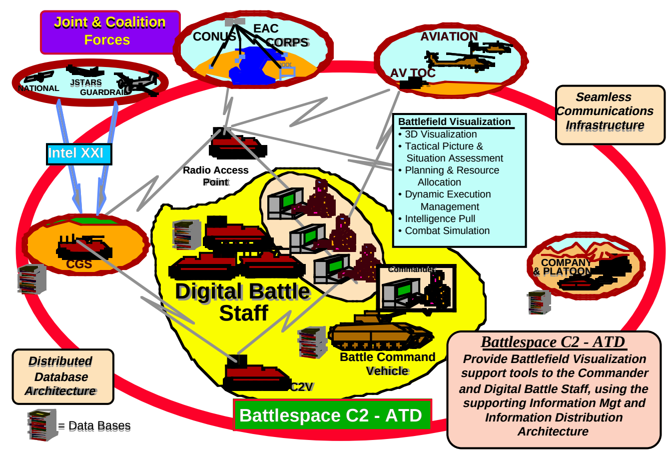
using combat visualization / wargaming support tools to enhance and speed decision / reaction / dissemination timelines

(b) A System Architecture interoperable with multi-echelon Joint/Allied assets that can provide faster / more accurate / more tailored battlespace information to the Mobile Strike Force (MSF) Commander / and Digital Battle Staff.

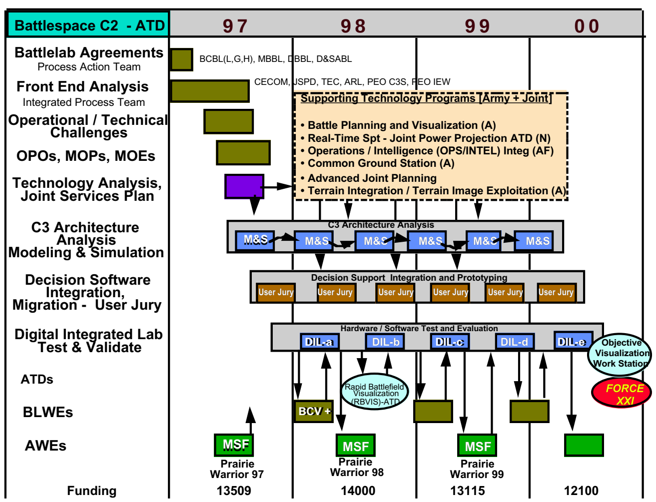
Collaborative efforts with JSPD, TEC, ARL will produce a series of simulations and prototypes of Battlefield Visualization Workstations (FY98/99/00) which will spt the Battle Labs in the evolution of the Battlefield Visualization and Digital Battle Staff Concepts

Battlelabs: BCBL-(G,L,H), MBBL, DBBL PEO: C3S

Battlespace C2 - ATD Architecture



SCHEDULE AND FUNDING:



BC2-ATD is a product integration and demonstration program, which is consistent with the DoD C3TAP and:

- **Leverages results of current Battlefield Digitization and Visualization initiatives:**
  - **TRADOC (AWEs, BLWEs, TF XXI Experiments)**
  - **PEO CCS / Comm / IEW: (ABCS, Applique', etc)**
  - **ATDs (CAC2, DBS, RFPI, CGS, Rapid Terrain Vis, etc.) & the Battlefield Vis - ACTD**
  - **Technology (ARL; CECOM 3D Vis, BPV STO, Decision Aids, Mission Planning, etc.)**
  - **ARPA (C2IS, GLOMO, JTF))**
  - **Joint initiatives (C3 TAP, JPSD)**
- **Supports the Mobile Strike Force / Digital Battle Staff (BCBL(G,L)), Intell XXI (BCBL(H)), and Battle Command Vehicle BCV (MBBL) initiatives to define / refine requirements**
- **Uses enhanced Modeling and Simulation tools to iteratively improve and demonstrate an expanded Systems Architecture**
- **Incorporates information system and knowledge base technologies (Leverage Joint technology initiatives (DoD C3 TAP), Adv Comms from DBC-ATD, Adv TOC and Mission Planning programs, Terrain Visualization from TEC, decision aids & advanced databases, etc. from ARL)**
- **Supports BLWE / AWEs / ACTDs with simulators and prototypes.**
- **Collaborative effort with RTV-ATD to feed Battlefield Visualization - ACTD and Force XXI**

Applications: Battlefield Vis, Div XXI, Corps XXI, Force XXI, Intel XXI

BATTLESPACE COMMAND AND CONTROL ATD PROVISIONAL EXIT CRITERIA

OPERATIONAL CAPABILITY	BASELINE	MINIMUM	GOAL
• DIGITAL BATTLE STAFF'S BATTLEFIELD VISUALIZATION CAPABILITY • INTEROPERABLE WITH MULTI-ECHELON JOINT/ALLIED ASSETS	• LIMITED CAPABILITY • NOT INTEROPERABLE	• INCREASED CAPABILITY • INTEROPERABLE WITH JOINT ASSETS	• SPEED DECISION/ REACTION/ DISSEMINATION TIMELINES • FASTER, MORE ACCURATE, MORE TAILORED BATTLESPACE INFORMATION WITH JOINT/ ALLIED FORCES

TOTAL DISTRIBUTION ATD

OBJECTIVES:

- **PROVIDE COMMANDERS/LOGISTICIANS AT STRATEGIC, OPERATIONAL, AND TACTICAL LEVELS ENHANCED CAPABILITIES TO PLAN, ANALYZE, MOBILIZE, DEPLOY, SUSTAIN, AND RECONSTITUTE MATERIEL, PERSONNEL, AND FORCES IN COMBAT OR CRISIS RESPONSE SITUATIONS.**
- **REDUCE LOGISTICS TIMELINES AND SUPPORT COSTS.**

JUSTIFICATION:

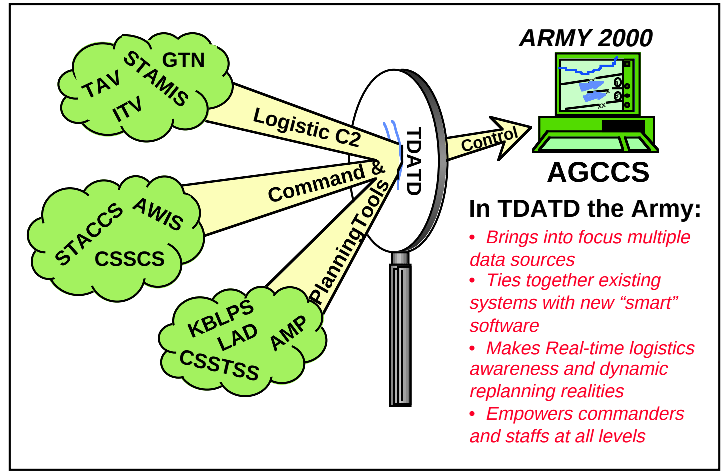
- **INADEQUATE AUTOMATION FOR LOGISTIC TASK ORGANIZATION, LOGISTICS COMMUNICATION, SOURCE DATA, AND PROCESSING OF EXTENSIVE, SEPARATED SOURCES.**
- **INADEQUATE LOGISTICS RELATIONAL DATA BASES AND DOCUMENTATION.**
- **INABILITY TO TRACK ASSETS IN TRANSIT OR IN PLACE**

BATTLELAB:

- **COMBAT SERVICE SUPPORT**

PEO:

CSSCS
AGCCS



SCHEDULE AND FUNDING

MILESTONES	94	95	96	97	98	99
INTEGRATION						
• ASSET VISIBILITY TASKS						
• INFRASTRUCTURE TASKS						
• DISPLAY & VISUALIZATION						
• SIMULATION/MODELING TASKS						
• DIL/COE EVALUATION						
• PEO/PM TRANSITION						
EXECUTION						
• CSSCS INTERFACE						
• AGCCS INTERFACE						
• FB2C2 INTERFACE						
• AWE SUPPORT						
LAM/PW						
AR						
TFXXI						
FUNDING	4.4	8.7	9.6	10.1		

APPROACH:

- **INTEGRATE EXISTING LEGACY AND EMERGING LOGISTICS C2 SYSTEMS, DATA BASES, AND STAMIS.**
- **MERGE TDATD/LAD "NUGGETS" INTO INITIAL BASELINE, THEN CONTINUE BUILDING ON THE LAD FOUNDATION.**
- **PROVIDE SEAMLESS CONNECTIVITY BETWEEN SOURCES AND USERS OF LOGISTICS INFORMATION.**
- **COMMON OPERATING ENVIRONMENT (COE) COMPLIANCE.**
- **VALIDATE CONCEPTS AND CAPABILITIES THROUGH THE CECOM DIGITAL INTEGRATION LABORATORY (DIL) AND AWEs.**
- **PROVIDE INITIAL PRODUCTS ON A STAND-ALONE WORKSTATION, THEN AS A CLIENT-SERVER ARCHITECTURE, AND FINALLY AS SOFTWARE MODULES FOR HOST SYSTEM INSTALLATION.**
- **TRANSITION ATD PRODUCTS TO PM/PEO MANAGED SYSTEMS FOR FURTHER DEVELOPMENT OR HOST PLATFORM INSTALLATION.**

APPLICATIONS:

- **PM, COMBAT SERVICE SUPPORT CONTROL SYSTEM (CSSCS)**
- **PM, ARMY GLOBAL COMMAND AND CONTROL SYSTEM (AGCCS) LOGISTICS FUNCTION**
- **U.S. ARMY TOTAL ASSET VISIBILITY (TAV)**

TOTAL DISTRIBUTION ATD EXIT CRITERIA

OPERATIONAL SHORTFALLS	ATD THRESHOLD	ATD GOAL	PROTOTYPE THRESHOLD CAPABILITY
Distribution Management	• Demonstrate a Semi-Automated Alert & Correlation of Logistically Related Problems/Needs • Simulate Semi-Automated Interface to Distributed Logistics Databases	• Demonstrate an Automated Alert & Correlation • Demonstrate an Automated Interface to Distributed Logistics Databases	• Automatic Alert & Correlation • Networked, Collaborative, Automatic Capability to Interface with Distributed Logistics Databases
Automation/Communications	• Demonstrate an Automated Link of Logistics Databases/ Systems	• Demonstrate an Automated Link of Logistics Databases/ Systems	• Automatic Electronic Updating of Logistics Databases/ Systems
In Transit/Total Asset Visibility	• Emulate Automated Source Data • Automate and Process 2500 Logistics Data Items (Sources) [≈ company size unit] • Locate Convoy on a Digital Map • Locate Supplies on the Installation or Containment Areas	• Demonstrate Semi-Automated Source Data • Automate and Process 160,000 Sources [≈ division size unit] • Locate Convoy on a Digital Map • Locate Supplies in a Specific Location; e.g. Supply Point or Distribution Activity Within 5 Meters	• Automatic Correlation to Source Data • Automate and Process ≥1,000,000 Sources [≈ two corps in each of two theaters] • Identify a Particular Vehicle/Container with Specific Supplies • Pinpoint Location of Supplies Down to Individual Boxes

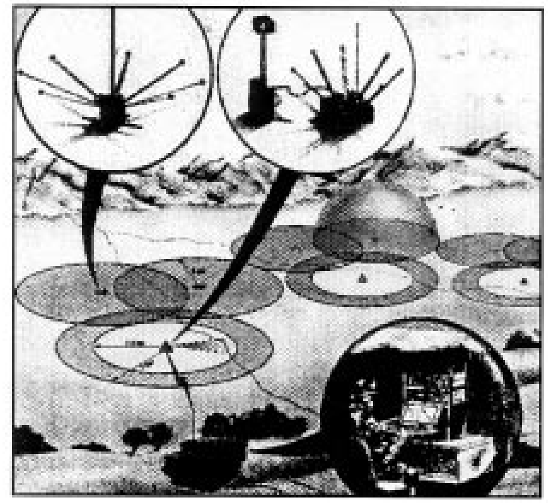
REMOTE SENTRY ATD
STO # III.H.06

OBJECTIVE:
- **DEMONSTRATE UNATTENDED, REMOTELY OPERATED, WIDE AREA GROUND-BASED SURVEILLANCE AND TARGET ACQUISITION DURING DAY/NIGHT AND LIMITED VISIBILITY CONDITIONS**

JUSTIFICATION:
- **KEY ATD IN SUPPORT OF RFPI ACTD**
- **EXTENDS THE SCOUT RANGE AND AREA SURVEILLANCE INCREASED FORWARD SCOUT/OBSERVER SURVIVABILITY THROUGH BATTLEFIELD AWARENESS**
- **REMOTELY CONTROLLED, INTEROPERABLE SENTRIES REDUCE FIELD OF REGARD "BLIND SPOTS"**

BATTLELAB:
- **DISMOUNTED BATTLESPACE**

PEO:
- **IEW (PM-NVEO)**



SCHEDULE AND FUNDING:

MILESTONE	FY93	FY94	FY95	FY96	FY97
MODEL/SIM R/S					
CONTRACT AWD					
DESIGN HDWE					
EARLY FIELD DEMO/AWEs					
EQUIP FAB/TEST					
DELIVERY					
RS ATD DEMO					
DEMO W/HSS ATD					
DELIV TO RFPI ACTD					
RFPI ACTD					
FUNDING: TOTAL $9.2M		**3.6**	**4.5**	**1.0**	

APPROACH:
- **UTILIZE STATE-OF-THE-ART AFFORDABLE, LIGHT WEIGHT SENSORS WITH DATA COMPRESSION AND IMAGE TRANSFER TO PRODUCE A REMOTE AREA SURVEILLANCE AND RECON SYSTEM (SINGLE AND MULTIPLE STATIONS) TO BE TESTED AND DEMONSTRATED AS PART OF RAPID FORCE PROJECTION INITIATIVE ACTD**
- **INCORPORATE IPPD APPROACH TO ADDRESS PRODUCIBILITY AND AFFORDABILITY RISK AREAS. USE STATISTICAL METRICS TO ESTIMATE AND MANAGE ATD SIGMA**

APPLICATIONS:
- **SCOUT PERIMETER SURVEILLANCE**
- **(SINGLE AND MULTIPLE) REMOTE WIDE AREA SURVEILLANCE**
- **TARGET ACQUISITION**
- **BATTLEFIELD DAMAGE ASSESSMENT**
- **SPECIAL OPERATIONS FORCES**

REMOTE SENTRY ATD EXIT CRITERIA

OPERATIONAL CAPABILITY	CURRENT CAPABILITY	END ATD	
		MINIMUM	GOAL
• 24 Hour, Autonomous, Remote, Surveillance, and Target Acquisition	• Non-Imaging Sensors – 350 m (Nominal)	• Day/Night Imaging – 1100 m Det (Man) 70% P_D – 2200 m Det (Veh) 70% P_D	• Day/Night Imaging – 1300 m Det (Man) – 2500 m Det (Veh) 70% P_D
• Image Compression/ Transmission – Total Duration (via SINCGARS)	• None (Data Only)	• 10 Seconds	• 5 Seconds
• False Alarm Rate	• 1% of Total Alarms/Day	• 1% of Total Alarms/Day	
• Power – Consumption	• Continuous Operation	• Remotely Activated/Cued-Activation	• Remotely Activated/Cued-Activation
– Source	• Line, Vehicle, or Battery	• Battery	• Battery
• Cost (Per Unit) @ 100 Units		• ≤$114.6K	≤ $83.2K

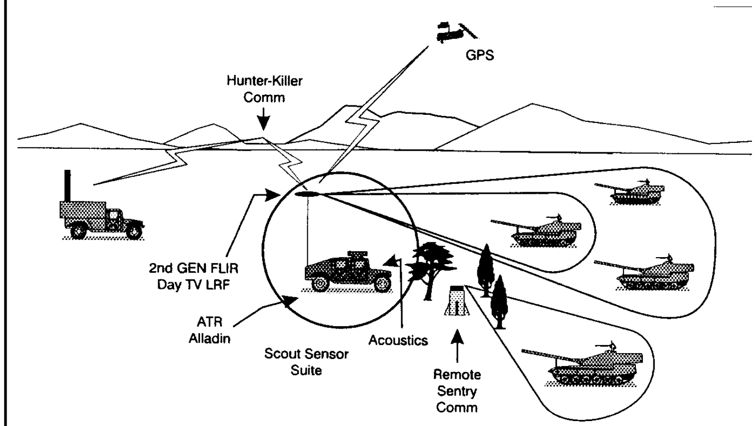
HUNTER SENSOR SUITE ATD
STO # III.H.02

OBJECTIVE:
- **DEMONSTRATE A LIGHTWEIGHT, DEPLOYABLE AND SURVIVABLE HUNTER VEHICLE WITH ADVANCED LONG RANGE SENSOR SUITE TO PROVIDE RAPID, MULTIPLE TARGET ACQUISITION & ENHANCED TARGET HANDOFF FOR RFPI NLOS KILLER VEHICLES**

JUSTIFICATION:
- **IMPROVES SURVIVABILITY**
  - **LOW OBSERVABLE PLATFORM AND SENSOR PAYLOAD**
  - **LONG RANGE TARGET ACQUISITION AND SEE FIRST/SHOOT FIRST CAPABILITY**
- **IMPROVES LETHALITY**
  - **PRECISION TARGETING FOR INDIRECT FIRE WEAPONS**
  - **AIDED TARGET RECOGNITION AND PRIORITIZATION**
  - **FACILITATES BATTLE DAMAGE ASSESSMENT**

BATTLELAB:
- **DISMOUNTED BATTLESPACE**

PEO:
- **IEW (SENSORS) (PM NVEO)**
- **ASM (INTEGRATION)**



SCHEDULE AND FUNDING:

MILESTONE	FY93	FY94	FY95	FY96	FY97	FY98
MODELING & SIMULATION						
MAST STUDY						
AWEs						
RFPI EARLY VERSION DEMO						
SENSORS DEVELOPMENT						
DEMO SUITE ON HMMWV						
ALGORITHM MOD/PROCESSOR INTEG						
IMAGE COMP/TRANSFER IMPL						
INTEG/DEMO SUITE HMMWV						
FINAL REPORT						Δ
RFPI EFOG-M ACTD						
FUNDING ($M)		4.4	10.1	14.1	14.6	2.6

APPROACH:
- **ON A LOW OBSERVABLE PLATFORM, INTEGRATE 2ND GENERATION THERMAL IMAGING, ACOUSTICS CUEING SENSOR, DAY TV, AND EYESAFE LASER RANGEFINDER TECHNOLOGY, COUPLED WITH MODULAR ATR ALGORITHMS & HIGH DENSITY PROCESSOR TO PRODUCE A LONG RANGE HUNTER SENSOR SYSTEM IN AN OPERATIONAL CONFIGURATION**
- **COMBINE HIGH ACCURACY POSITION/LOCATION SENSORS, IMAGE COMPRESSION TECHNIQUES, AND SECURE COMMUNICATIONS TO HANDOFF PRECISION TARGETING INFORMATION**
- **UTILIZE VPS TO EVALUATE HUNTER CONCEPTS AND MAN-MACHINE INTERFACE FUNCTIONALITY**
- **DEMONSTRATE SYSTEM AS PART OF THE RFPI ACTD**
- **INCORPORATE IPPD APPROACH TO ADDRESS PRODUCIBILITY & AFFORDABILITY RISKS AND USE STATISTICAL METRICS TO ESTIMATE AND MANAGE ATD SIGMA**

APPLICATIONS:
- **RFPI UMBRELLA PROGRAM AND RFPI ACTD**
- **TECH TRANSFER TO LRAS3 & FUTURE SCOUT & COMBAT VEHICLES**

HUNTER SENSOR SUITE ATD EXIT CRITERIA

OPERATIONAL CAPABILITY	CURRENT CAPABILITY	END ATD		TENTATIVE REQUIREMENT E&MD
		MINIMUM	GOAL	
• **LONG RANGE, 24 HOUR TARGET ACQUISITION, SURVEILLANCE, & BDA**	• AN/TAS-6 W/2X LENS	• 2ND GENERATION SENSOR SUITE	• 2ND GENERATION SENSOR SUITE	• ENHANCED 2ND GEN SENSOR SUITE
- RECOGNITION RANGE [PR, 70%]* (NORMALIZED)	- 1X	- 1.3X	- 1.7X	- 1.7X
• **TARGET RECOGNITION**	• MANUAL	• AIDED TARGET RECOGNITION	• AIDED TARGET RECOGNITION	• AIDED TARGET RECOGNITION
- FALSE ALARM RATE [PD, ___%]* [PR, ___%]*	- N/A	- 1X/DEG^2	- 5X/DEG^2	- 5X/DEG^2
- TIME TO DETECT	- 100 SEC	- 20 SEC	- 15 SEC	- 15 SEC
• **RECEIVE & TRANSMIT TARGETING INFORMATION (VOICE/DATA/IMAGERY)**	• NONE	• DATA COMPRESSION RECEIPT & TRANSFER	• DATA COMPRESSION RECEIPT & TRANSFER	• DATA COMPRESSION RECEIPT & TRANSFER
- TRANSMISSION TIME	- N/A	- < 15 SEC	- 10 SEC	- <10 SEC
• **PRECISION TARGET LOCATION**	• ESTIMATED RANGE	• POSITIONING SENSORS	• POSITIONING SENSORS	• POSITIONING SENSORS
- ACCURACY	- 400-600 M	- 50 M	- 30 M	- 30 M

*Target, Background & Atmospheric Assumptions are specified in Technical SOW

TARGET ACQUISITION ATD
STO #III.G.08

OBJECTIVE:

- DEMONSTRATE AUTOMATED WIDE AREA SEARCH, ACQUISITION, IDENTIFICATION, AND PRIORITIZATION WITH AUTOMATED CUEING/TRACKING/ HANDOFF AT EXTENDED RANGES TO ALLOW REDUCED CREW WORKLOAD/TIMELINES IN SUPPORT OF LETHAL, DEPLOYABLE COMBAT VEHICLES WITH FEWER CREW MEMBERS

JUSTIFICATION:

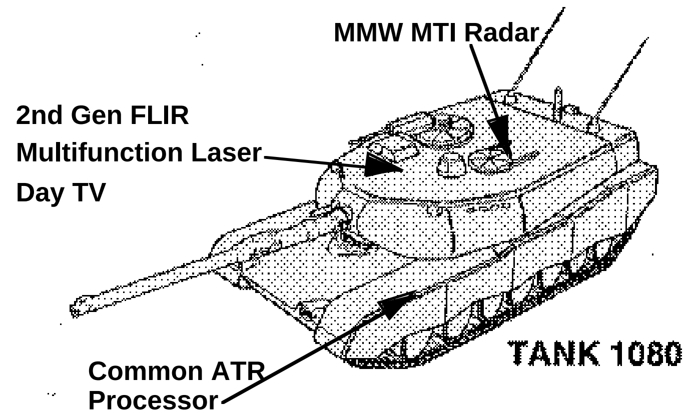
- ADDRESSES KEY USER REQUIREMENTS FOR FUTURE COMBAT VEHICLES AND COMBAT VEHICLE UPGRADES
  - DEPLOYABILITY - LIGHTER VEHICLE, REDUCED CREW
  - LETHALITY - DEGRADED CONDITION FIRE CONTROL
  - SURVIVABILITY - SEE FIRST, SHOOT FIRST

BATTLELAB:

- MOUNTED BATTLESPACE

PEO:

- IEW (SENSORS) (PM NVEO)
- ASM (INTEGRATION)



SCHEDULE AND FUNDING:

MILESTONE	FY94	FY95	FY96	FY97	FY98
MODELING & SIMULATION					
WARFIGHTING FIELD EXPERIMENT					
AWARD					
SENSORS FAB/PKG/INTEG					
DEMO/BASELINE SENSOR SUITE PERFORMANCE					
ALGORITHM MODIFICATION/ PROCESSOR INTEGRATION					
MTI MMW RADAR				Demo	
MULTIFUNCTION LASER				Demo	
SENSOR FUSION GROWTH DEMO				Demo	
INTEGRATED/DEMO SENSOR SUITE, PROCESSOR, AND RADAR ON SURROGATE VEHICLE					
FUNDING: Total $22.5M	0.5	6.9	6.6	8.5	

APPROACH:

- THE TARGET ACQUISITION ATD MTI RADAR AND THE GIMBAL SCAN FLIR WILL PERFORM TARGET DETECTION THEN HAND-OFF TARGET POSITIONS TO THE FLIR SENSOR/MULTI-FUNCTION LASER SENSOR (FUTURE STI RADAR SENSOR) FOR AID TARGET ID.
- INTEGRATE A MULTI-FUNCTION LASER, SECOND GENERATION FLIR SENSOR SUITE, AND A HIGH DENSITY PROCESSOR COUPLED WITH MODIFIED ATR ALGORITHMS AS A "B" KIT INTO A SURROGATE CHASSIS FOR OPERATIONAL DEMONSTRATION
- PROVIDE MTI/MMW RADAR (STI GROWTH POTENTIAL) FOR TARGET ACQUISITION, TRACKING & CUEING ENHANCEMENT IN DEGRADED CONDITIONS
- INTEGRATE WITH CAC2 NETWORK THROUGH CREWMANS ASSOCIATE ATD FOR IMPROVED SITUATIONAL AWARENESS
- INCORPORATE IPPD APPROACH TO ADDRESS PRODUCIBILITY AND AFFORDABILITY RISKS AND USE STATISTICAL METRICS TO ESTIMATE AND MANAGE ATD SIGMA
- EMPLOY FLIR/LASER SENSOR FUSION, DESIGN FOR GROWTH TO FULL SENSOR FUSION (STI RADAR)
- TECHNOLOGY FEED TO THE MWBL-SPONSORED ACT II LATARS PROGRAM
- DEMONSTRATION AS PART ADVANCED TANK TECHNOLOGIES TD

APPLICATIONS:

- TECH TRANSFER TO FUTURE MAIN BATTLE TANK, FSV
- POTENTIAL UPGRADES (ABRAMS, BRADLEY, LRAS3)

TARGET ACQUISITION ATD EXIT CRITERIA

OPERATIONAL CAPABILITY	GEN II FLIR (Baseline - No Automation)	END ATD SENSOR SUITE	
		MINIMUM	GOAL
• TARGET DETECTION			
– MOVING/STAT	1.0 Good 0.5 Bad	1.2 Good 0.6 Bad	1.5 Good 1.2 Bad
– HULL DOWN	0.6 Good 0.4 Bad	0.6 Good 0.4 Bad	0.7 Good 0.5 Bad
• IDENTIFY TARGET			
– MOVING/STAT	0.5 Good 0.3 Bad	0.8 Good 0.6 Bad	1.0 Good 0.7 Bad
– HULL DOWN	0.3 Good 0.2 Bad	0.7 Good 0.5 Bad	0.9 Good 0.6 Bad
• TIME TO DETECT	90 Sec	15-20 Sec	10-15 Sec
• FALSE ALARM RATE	N/A	0.06*	0.01*

NOTE: ALL RANGE CRITERIA ARE NORMALIZED. * INDICATES MSAT-AIR ATD BASED VOLUMES.

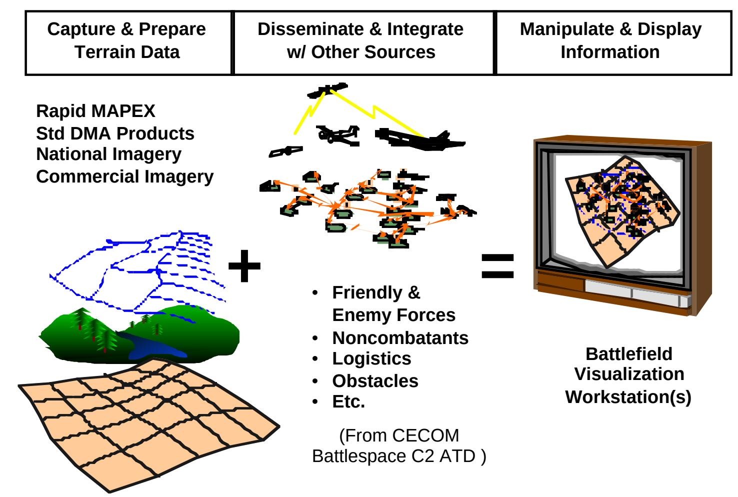
RAPID TERRAIN VISUALIZATION (RTVIS) ATD

OBJECTIVE:

- INTEGRATE TECHNOLOGIES FOR RAPID, HIGH RESOLUTION DIGITAL TERRAIN DATA (DTD) GENERATION, DISSEMINATION, AND DISPLAY/UTILIZATION.
- DEMONSTRATE DTD MERGED WITH INTEL DATA AS FOUNDATION FOR BATTLEFIELD VISUALIZATION.

JUSTIFICATION:

- EMERGING CAPABILITIES MUST BE INTEGRATED TO ENSURE AVAILABILITY OF CRITICAL TERRAIN DATA TO WARFIGHTER.
- ARMY DOES NOT HAVE HIGH RESOLUTION DIGITAL TERRAIN DATA NEEDED FOR MISSION PLANNING AND EXECUTION WORLDWIDE.
- CAPABILITY TO INTEGRATE TERRAIN DATA WITH INTEL AND SITUATIONAL AWARENESS DATA IS LIMITED.



SCHEDULE AND FUNDING:

MILESTONE	FY97	FY98	FY99	FY00
•IFSAR				
– FLIGHT/DEMO	Δ	Δ	Δ	Δ
– ENHANCE PROC				
•AUTO FEATURE DATA				
– BASELINE DEMOS	Δ Δ			
– HI-RES FEATURES				
•EXPLOIT EMERGING DTD SOURCES	Δ	Δ		
•USER SUPPORT				
– RAPID MAPEX				
– XVII ABN CORPS				
•DEMO @ AWEs	TFXXI	DIV AWE	CORPS AWE	CORPS/ TF AWE
FUNDING	$3.900	$7.933	$9.221	$7.360

APPROACH:

- DEMONSTRATE RAPID GENERATION OF DIGITAL TOPOGRAPHIC DATA (DTD) TO SUPPORT FORCE PROJECTION TIMELINES (EARLY ENTRY)
- INTEGRATE DTD WITH INTELLIGENCE AND SITUATIONAL AWARENESS DATA FROM BC2 ATD.
- USE EXISTING AND EMERGING WIDEBAND ELECTRONIC COMMUNICATIONS TO DISSEMINATE DATA TO USERS.
- DEMONSTRATE/INTEGRATE IFSAR CAPABILITIES TO PRODUCT HIGH RESOLUTION ELEVATION DATA.
- INTEGRATE SEMI-AUTOMATED FEATURE EXTRACTION CAPABILITIES TO PROVIDE RAPID FEATURE DATA FOR CONTINGENCY OPERATIONS.

APPLICATIONS:

ABCS, TEM, DTSS, CCTT, BVIS-ACTD

RAPID TERRAIN VISUALIZATION ATD EXIT CRITERIA

OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
• COLLECTION MANAGEMENT	• DE-CENTRALIZED, MANUAL	• SEMI-AUTOMATED PROCESS	• INTEGRATED AND AUTOMATED PROCESS
• ELEVATION DATA GENERATION	• DMA, CARTO SOURCE, DTED LEVEL I (100m) & II (30m)	• IMAGE OR IFSAR SOURCE, MULTI-RES, LEVEL III (10m)	• MIL PLATFORM IFSAR OR IMAGE SOURCE, TAILORED RES, LEVEL V (1m)
• FEATURE DATA GENERATION	• DMA, CART SOURCE, ITD, LABOR INTENSIVE	• IMAGE SOURCE, SEMI-AUTOMATED, LIMITED FEATURE CONTENT	• ANY SOURCE, SEMI-AUTOMATED, ITD-LIKE FEATURE CONTENT
• SPATIAL DATA MANAGEMENT	• NO CURRENT CAPABILITY FOR MULTI-RES, MULTI-SCALE	• HIERARCHICAL DATABASE FOR FINITE SET OF RESOLUTIONS & SCALES	• FLEXIBLE HIERARCHICAL DATABASE FOR MULTI-RES, MULTI-SCALES
• DATA TRANSFORM FOR C2 & MISSION PLANNING SYSTEMS	• MANUAL, ONE-AT-A-TIME FOR NON-DMA COMPLIANT SYSTEMS	• AUTOMATED FOR ONE BV SYSTEM	• AUTOMATED FOR SUITE OF BV SYSTEMS
• DATA DISSEMINATION	• MAG TAPE OR CD-ROM	• NEAR-REAL-TIME ELECTRONIC, COTS	• NEAR-REAL-TIME ELECTRONIC, MILITARY
• DATA DISPLAY/USE	• 2-D CAPABILITY, LIMITED 3-D	• 3-D MISSION PLANNING ON COTS PORTABLE WORKSTATION	• BV CAPABILITY ON MULTI-PLATFORMS, MULTI-APPS

BATTLEFIELD COMBAT IDENTIFICATION (BCID) ATD
STO # III.E.07

OBJECTIVE:

IMPROVE COMBAT EFFECTIVENESS AND SUBSTANTIALLY REDUCE FRATRICIDE

PHASE I DEMO:

- **DEMONSTRATE A FULLY DIGITIZED SA/TARGET ID CAPABILITY AT PLATFORM LEVEL WITHIN A DIGITIZED BDE**
- **DEMONSTRATE EXTENSION OF BCIS TO AIR-TO-GROUND**
- **DEMONSTRATE JOINT/ALLIED INTEROPERABILITY**

PHASE II DEMO:

- **DEMONSTRATE ADVANCED CONCEPTS FOR A FULLY DIGITIZED, FRIEND, FOE AND NEUTRAL TARGET ID/TARGET ACQUISITION/SA CAPABILITY INTEGRATED WITHIN A DIGITIZED DIV**

JUSTIFICATION:

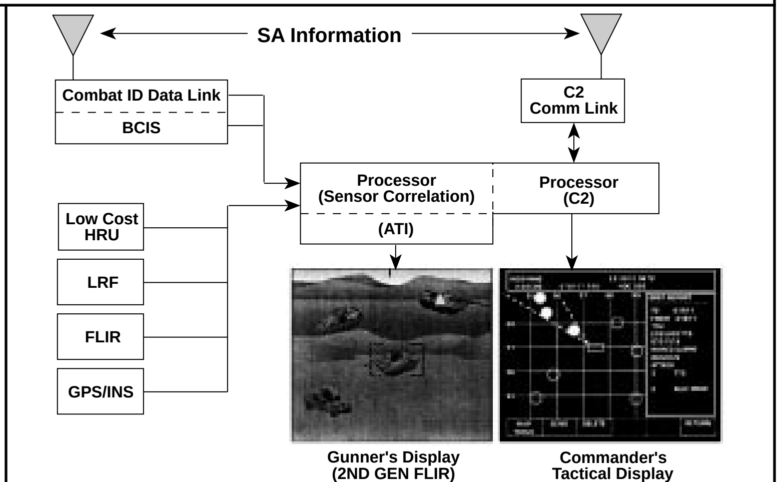
- **BATTLEFIELD COMBAT ID ORD/TRADOC OPS CONCEPT**

BATTLELAB:

- **MOUNTED BATTLESPACE**
- **DISMOUNTED BATTLESPACE**

PEO:

- **PEO IEW (PMCI)**



SCHEDULE AND FUNDING:

MILESTONE	FY93	FY94	FY95	FY96	FY97	FY98
STUDY PHASE	Concepts and Technical Options					
SIMULATION/ MODELING PHASE	Develop Tools, Models, and Scenarios			Force on Force Runs		
HW DEVELOPMENT PHASE		CI Hardware Testbed	Demonstrators Developed		MS Decision	DEM VAL or EMD
DEMO PHASE			DWBL AWE, MWBL AWE	Phase I Demo	HTI AWE	Phase II Demo
FUNDING ($M)	2.8	6.0	8.3	7.0	7.4	3.5

APPROACH:

FY96

ENHANCED BCIS
- **PERFORMANCE ENHANCEMENTS**
- **INTEROPERABILITY**
- **PLATFORM EXTENSIONS**

SITUATIONAL AWARENESS
- **BCIS DIGITAL DATA LINK**
- **DATA CORRELATION (BCIS/ESA/CAC2)**
- **DISPLAY THRU TA SIGHT**
- **DISPLAY ON COMMANDER'S TACTICAL DISPLAY**

FY98

TARGET ID
- **LPD EMBEDDED SIGNATURE**
- **DISMOUNTED SOLDIER**

TARGET ACQUISITION
- **ATI (FLIR AND MULTISENSOR)**
- **IMPROVED FLIR OPERATOR ID PERFORMANCE**

ENGAGEMENT SA
- **DISMOUNTED SOLDIER**

APPLICATIONS:

- **ALL US, NATO AND POTENTIAL COALITION COMBAT, COMBAT SUPPORT AND COMBAT SERVICE SUPPORT SYSTEMS**

BATTLEFIELD COMBAT IDENTIFICATION (BCID) (1996) EXIT CRITERIA					
OPERATIONAL CAPABILITY	**CURRENT BASELINE**	**NEAR-TERM BASELINE**	**ATD MINIMUM**	**ATD GOAL**	**EMD**
Target Identification					
• Equipment	1st Gen FLIR, 2nd & 3rd Gen I^2, DVO, "Budd" Lights, CID Boards	BCIS	Enhanced BCIS, 2nd Gen FLIR	Enhanced BCIS, 2nd Gen FLIR	Enhanced BCIS, 2nd Gen FLIR
• PID (Friendly Ground Vehicles)	Limited by Multiple Factors	90%	98%	99%	98%
• Range	Limited by Resolution and Weather	1.5 X Weapon EFF Range	1.5 X Weapon EFF Range	1.5 X Weapon EFF Range	1.5 X Weapon EFF Range
Situational Awareness					
• Position Correlation Method	Manual Reporting	Manual Reporting	Automatic (Using BCIS DDL)	Automatic (Using BCIS DDL & CAC2)	Automatic (Using BCIS DDL & CAC2)
• Continuous Correlation Accuracy	~500 Meters	~500 Meters	100 Meters	50 Meters	≤100 Meters
Army Platform Extension	Ground Vehicles (Limited Capability)	Ground Vehicles (BCIS)	Add Rotary Wing Aircraft	Add Rotary Wing Aircraft	Add Rotary Wing Aircraft
Joint Interoperability	None	None	Fixed Wing Aircraft	Fixed Wing Aircraft	Fixed Wing Aircraft

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BATTLEFIELD COMBAT IDENTIFICATION (BCID) (1998) EXIT CRITERIA

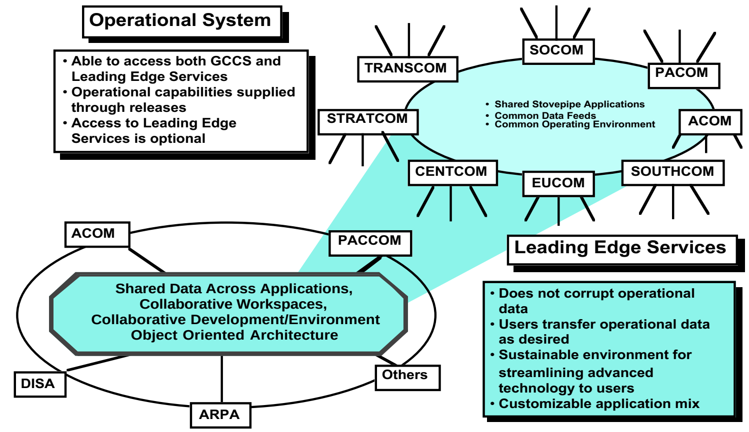
OPERATIONAL CAPABILITY	MID-TERM BASELINE	ATD MINIMUM	ATD GOAL	EMD
Target Identification				
• Cooperative (Friends)	BCIS Q & A	LPD Embedded Signatures	LPD Embedded Signatures	LPD Embedded Signatures
• Non-cooperative (Foe & Neutrals)	2nd Gen FLIR (Manual)	2nd Gen FLIR ATI Multisensor ATI	2nd Gen FLIR ATI Multisensor ATI	2nd Gen FLIR ATI Multisensor ATI
- ID Time	1 X	0.3 X	0.1 X	0.1 X
- PID	80%	95% Min	99% Min	95% Min
Platform Extension	Ground Vehicles and Aircraft	Add Dismounted Soldiers	Add Dismounted Soldiers	Add Dismounted Soldiers

ADVANCED JOINT PLANNING ATD

PRODUCTS:

- READINESS
  - Planning Tool (ADAPT) and Joint Readiness Automated Management System (JRAMS) for USACOM
  - Automated Joint Monthly Readiness Review (JMRR) and Joint Automated Readiness System (JARS) for Joint Staff
- CAMPAIGN PLANNING EMPLOYING JTF ATD JOINT PLANNING SYSTEM (JPS) TOOLS
  - CONOPS-evolved Air Campaign Planning Tool (ACPT) and Joint Campaign Planning Tool (JCPT)
- JPS REHEARSAL AND EVALUATION EMPLOYING JPS TOOLS
  - Synthetic Theater Analysis and Rehearsal Environment
  - Multiple Theater Planning and Exercise Tool

MAJOR CONTRACTORS: SAIC, BBN, ISX



MAJOR MILESTONES:

- ACCOMPLISHMENTS
  - Initial demonstration of readiness management application and logistics feasibility analysis capabilities
- MILESTONES
  - FY96 Demonstrate interoperability of readiness, logistic, transportation in campaign planning context
  - FY97 Integrate readiness and logistics management tools with modeling and simulation capability to develop and evaluate employment courses of action and provide robust, predictive plans and alternatives

OBJECTIVE/APPROACH:

- DEMONSTRATE, HARDEN, AND LEAVE IN PLACE ENHANCED C4I TECHNOLOGIES WHICH GREATLY ENHANCE THE CINC's ABILITY TO CONDUCT OPERATIONS
  - Enhance CINC's readiness assessment, campaign planning, and rehearsal capabilities

    --Reduce planning cycle times from weeks to days/hours

    --More effective and efficient
  - Transition supportable systems through DISA LES or appropriate service support agents
- APPROACH: CONOPS DEVELOPMENT AND TRANSITION
  - Evolve user's operational C4I processes through rapid "plug in" of advanced technology from other ARPA programs
  - Execute program through user's environment (USACOM)
  - Transition capabilities to GCCS via ARPA-DISA JPO's Leading Edge Services

ADVANCED JOINT PLANNING ATD PROVISIONAL EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
• CAMPAIGN PLANNING FOR JTF	• PLANNING CYCLE TIME—WEEKS	• ENHANCED C4I CAPABILITIES REDUCING CYCLE TO DAYS	• CYCLE TIME IN HOURS

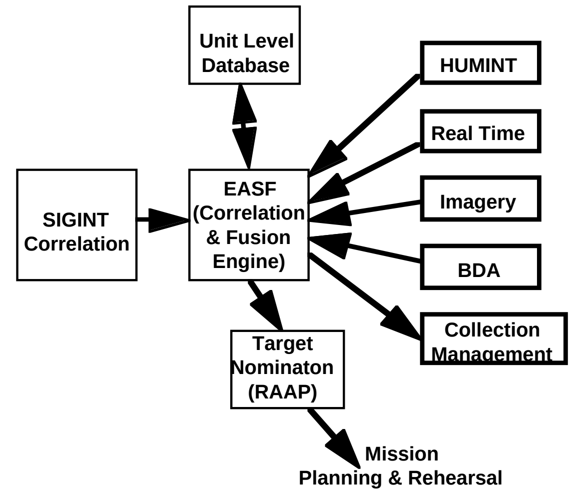
ENHANCED ALL-SOURCE FUSION TECHNIQUES FOR ELECTRONIC WARFARE PLANNING AND EXECUTION

PROBLEM/NEED:

- NRT DETECTION, LOCATION, AND IDENTIFICATION OF MOBILE RED, BLUE, AND GRAY COMPONENTS OF THE ELECTRONIC ENVIRONMENT. ABILITY TO CORRELATE, FUSE, AND REASON ABOUT INTELLIGENCE AND SURVEILLANCE DATA.

USER ADVOCACY:

- CSAF C4I REVIEW — SEPTEMBER 1992



MILESTONES:	**TIME FRAME**
• DEMO SENSOR CUEING AND INFORMATION ACQUISITION MODULE	4/96
• DEMO COMBINED FUSION ALGORITHM AND HEURISTIC REASONING MODULE	3/97
• DEMO ALL-SOURCE FUSION MODULE	2/98

FUNDING REQUIRED ($M):

FY95	FY96	FY97
0.520	1.185	0.795

APPROACH:

- COMBINE PROVEN MATHEMATICAL FUSION ALGORITHMS WITH HEURISTIC RESONING AND SENSOR CUEING TO PERFORM NRT ELECTRONIC ENVIRONMENT ANALYSIS

TECHNOLOGY TRANSITION VEHICLE:

- RAPID PROTOTYPING, DEVELOP TRANSITION PLAN

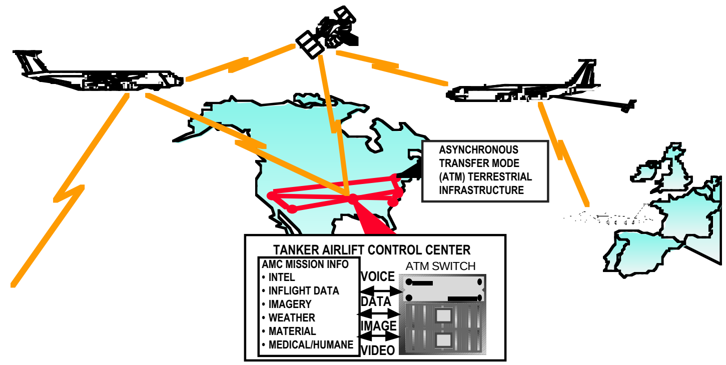
ENHANCED ALL-SOURCE FUSION TECHNIQUES FOR ELECTRONIC WARFARE PLANNING AND EXECUTION PROVISIONAL EXIT CRITERIA

OPERATIONAL CAPABILITY	BASELINE	MINIMUM	GOAL
• DETECT, LOCATE, AND IDENTIFY MOBILE RED, BLUE, AND GRAY COMPONENTS OF ELECTRONIC ENVIRONMENT	• SOURCES ARE INDIVIDUAL INPUTS	• SYNTHESIZE INPUTS	• SENSOR CUEING AND INFORMATION ACQUISITION MODULE CORRELATING ALL INPUTS
• CORRELATE, FUSE, AND REASON ABOUT INTELLIGENCE AND SURVEILLANCE DATA	• PROVEN FUSION ALGORITHMS	• COMBINE PROVEN ALGORITHMS WITH HEURISTIC REASONING AND SENSOR CUEING	• PERFORM NRT ELECTRONIC ENVIRONMENT ANALYSIS

INFORMATION FOR THE WARRIOR

PROBLEM:

- CAPABILITY FOR DEPLOYED U.S. WARRIOR TO REACH BACK TO NATIONAL RESOURCES, THROUGH HIGH PERFORMANCE MULTI-NATIONAL, COMMERCIAL/MILITARY INFRASTRUCTURE FOR COMMAND AND CONTROL INFORMATION.



PAYOFF:

- PROVIDE AIR MOBILITY COMMAND* WITH
  - IN-TRANSIT VISIBILITY
  - AIRBORNE SITUATION AWARENESS

*1996 Air Mobility Master Plan

ACCOMPLISHMENT:

- TECHNOLOGY PROGRAM VALIDATED BY AMC AS RESPONSIVE TO OPERATIONAL NEEDS
- COST, FEASIBILITY, AND RISK ASSESSMENT COMPLETED
- OBTAINED MOBILITY TPIPT ADVOCACY
- PROGRAM INITIATED 1 MAR 96

INFORMATION FOR THE WARRIOR PROVISIONAL EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
• OBTAIN COMMAND AND CONTROL INFORMATION FROM NATIONAL RESOURCES	• INFORMATION AVAILABLE IN THEATER	• INFORMATION PROVIDED THROUGH SINGLE SOURCE	• MULTI-NATION COOPERATIVE NETWORK • ATM RF TRANSMISSION SYSTEM BETWEEN AIRCRAFT AND TERRESTRIAL ATM SWITCHED NETWORK
• PROVIDE ALL DATA IN ANY FORM	• DATA AVAILABLE	• VOICE/DATA APPLICATION	• MULTI-MEDIA APPLICATION

JOINT FORCE AIR COMPONENT COMMANDER'S TOOL KIT (JFACC TOOL KIT)

PRODUCTS:

- TARGET SYSTEMS ANALYSIS TOOLSET
- COURSE OF ACTION DEFINITION AND EVALUATION TOOLS
- CAMPAIGN ASSESSMENT TOOLS WHICH RELATE INTELLIGENCE TO OPERATIONAL CAMPAIGN GOALS
- CONTINUOUS AIR CAMPAIGN PLAN GENERATOR (INCLUDING INTEGRATED STRIKE, RECCE, AND LOGISTICS PLANNING)
- WORKFLOW MANAGEMENT TOOLS WHICH MANAGE THE PLANNING PROCESS
- SOFTWARE INFRASTRUCTURE SERVICES WHICH ENABLE DISTRIBUTED AND COLLABORATIVE PLANNING

CONCEPT:

- PROVIDE A STRATEGY DEVELOPMENT AND CAMPAIGN ASSESSMENT CAPABILITY THAT IS INTEGRATED WITH THE AIR CAMPAIGN PLANNING PROCESS. MULTIPLE COURSES OF ACTION CAN BE EVALUATED TO SELECT THE BEST STRATEGY. CRITICAL TARGET NODES WITHIN COMPLEX TARGET SYSTEMS CAN BE IDENTIFIED. ASSESSMENT RELATIVE TO CAMPAIGN GOALS CAN BE MADE QUICKLY.
- PROVIDE A CONTINUOUS DYNAMIC AIR CAMPAIGN PLANNING AND ENGAGEMENT CAPABILITY THAT ENABLES "JUST-IN-TIME" TASKING AND MORE EFFICIENT USE OF ASSETS. VISUALIZATION OF THE AIR CAMPAIGN PLAN AND POTENTIAL CHANGE IMPACTS WILL SUPPORT RAPID JFACC DECISION MAKING. BETTER PLANS WILL BE DEVELOPED BY EVALUATING MORE THOROUGHLY ALTERNATIVE PLANS AND PROJECTING THE EFFECT OF DECISIONS INTO THE FUTURE.
- PROVIDE A TAILORABLE ARCHITECTURE AND SET OF PLANNING PROCESSES WHICH CAN SUPPORT VARIOUS CRISIS LEVELS AND COALITION OPERATIONS. ENABLE MULTIPLE CONCEPTS OF OPERATION TO INCLUDE DECENTRALIZED EXECUTION, INTEGRATED PLANNING PROCESS TEAM ACROSS ECHELONS AND SERVICES, AND REDUCED FORCES FORWARD SUPPORTED BY REMOTE STAFFS.

SCHEDULE:

• INTEGRATED STRIKE, RECCE, AND LOGISTICS PLANNING	JAN. 1997
• TARGETING AND MASTER AIR ATTACK PLANNING (INCLUDES TARGET SYSTEMS TOOLS)	SEP. 1997
• CONTINUOUS PLANNING CONCEPT TECHNOLOGIES	SEP. 1998
• CONTINUOUS PLANNING AIR CAMPAIGN PLAN GENERATION (INCLUDES COA, CAMPAIGN ASSESSMENT, DISTRIBUTED/ COLLABORATIVE TOOLS)	SEP. 1999
• "JUST-IN-TIME" AIR CAMPAIGN PLANNING (INCLUDES WORKFLOW MANAGEMENT)	SEP. 2000

TECHNICAL APPROACH:

- DEVELOP SEMI-AUTOMATED MESSAGE HANDLING TOOLS AND INFORMATION RETRIEVAL/MONITORING AGENTS WHICH CAN RELATE THE INTELLIGENCE DAMAGE REPORTS TO CAMPAIGN GOALS. DEVELOP TARGET SYSTEMS ANALYSIS TEMPLATES WHICH CAN MODEL COMPLEX TARGET SYSTEMS TO IDENTIFY CRITICAL NODES.
- DEVELOP AN AIR CAMPAIGN PLAN GENERATION PROCESS WHICH IS SITUATION DRIVEN, NOT CYCLIC. PLANNING FOLDERS WILL BE INITIATED—PASSED AS TASKING "JUST IN TIME" BASED ON CURRENT SITUATION. SYNCHRONIZE STRIKE, RECONNAISSANCE, AND LOGISTICS PLANNING TO MEET OBJECTIVES. DEVELOP VISUALIZATION AND PLAN EVALUATION TOOLS TO SUPPORT ALTERNATIVE PLAN SELECTION.
- DEVELOP A DISTRIBUTED, COLLABORATIVE INFRASTRUCTURE TO SUPPORT THE PLANNING PROCESSES. EXTEND FUTURE MULTI-LAYER SOFTWARE ARCHITECTURES TO TAKE ADVANTAGE OF COMMON SERVICES. DEVELOP WORKFLOW MANAGEMENT PROCESSES AND AGENTS TO FACILITATE CONTROL AND BUILD OF CAMPAIGN PLAN.

JFACC PROVISIONAL EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
• RELATE INTELLIGENCE DAMAGE REPORTS TO CAMPAIGN GOALS	• MANUAL TOOL	• SEMI-AUTOMATIC TOOLS	• AUTOMATED TOOLS
• DEVELOP SITUATION DRIVEN AIR CAMPAIGN GENERATION PROCESS	• CYCLIC PROCESS	• SITUATION DRIVES OVERALL PLANNING	• "JUST IN TIME" TASKING
• DISTRIBUTED, COLLABORATIVE INFRASTRUCTURE TO SUPPORT PLANNING	• UNIDIMENSIONAL PLANNING	• MORE THAN 1 LEVEL	• MULTI-LAYER ARCHITECTURE

SURVIVABLE ATM ATD

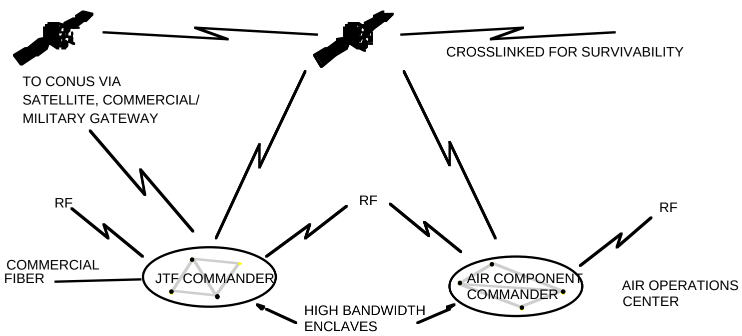
PROBLEM/NEED:

- ACHIEVE AND MAINTAIN RELIABLE PERFORMANCE OF ASYNCHRONOUS TRANSFER MODE (ATM) NETWORKS IN A FIELD ENVIRONMENT

USER ADVOCACY:

- ESC/TG, ACC/SC/DR/IN, AMC, DISA, ARMY, NAVY

DEPLOYED ATM CAPABILITY



HIGH PERFORMANCE NETWORKS BRIDGED BY SATELLITE AND ADAPTIVE MULTI-BAND RF

MILESTONES:

- SUBSYSTEM DESIGN COMPLETE 4/96
- PROTOTYPE COMPONENTS AVAILABLE 3/97
- INTEGRATION OF CAPABILITIES 4/97
- COMMENCE ATD FIELD TESTING 1/98
- TECH TRANSITION TO 6.3B 1/99

FUNDING ($K):

FY96	FY97	FY98	TOTAL
371	890	459	1720

APPROACH:

- PROTOTYPE CAPABILITIES FOR END-TO-END MULTIMEDIA ATM C21 APPLICATIONS OVER TACTICAL LINKS
  – ATM ADAPTATION LAYER
  – ERROR CONTROL
  – NETWORK MANAGEMENT

TECHNOLOGY TRANSITION VEHICLE:

- TECH TRANSFER VIA 6.3B RAPID PROTOTYPE TO THE FIELD

SURVIVABLE ATM ATD PROVISIONAL EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
• PERFORMANCE OF ATM NETWORKS IN FIELD	• NETWORKS OPERATE INDEPENDENTLY	• ATM CAPABILITY	• HIGH PERFORMANCE NETWORKS BRIDGED BY SATELLITE AND ADAPTIVE MULTI-BAND RF

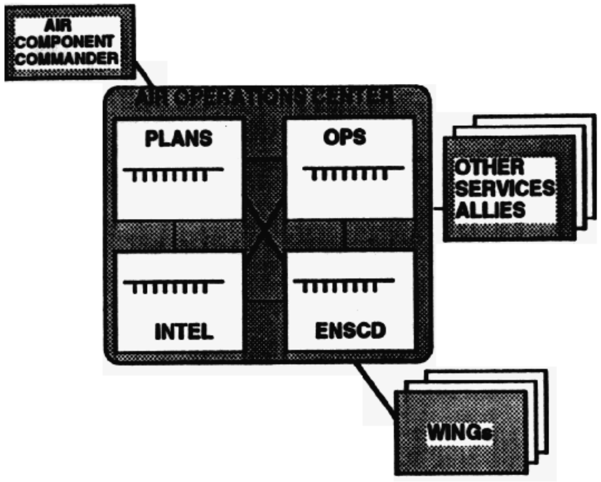
OPS/INTEL INTEGRATION ATD

PROBLEM/NEED:

- ENHANCED COORDINATION AND MORE TIMELY INFORMATION EXCHANGE FOR JFACC AND AIR OPS CENTER

USER ADVOCACY:

- TBM GEN OFFICERS STEERING GROUP—AUG 91
- HQ TAC/DRI MSG—SEP 91



MILESTONES:

- CONCEPT PLAN 3/95
- OPS-INTEL DBs 1/96
- OPS-INTEL PROTOTYPES 2/97
- ATD TECH DEMO (ATD) 6/97

FUNDING ($K):

FY94	FY95	FY96	FY97
150	1100	966*	737

*PENDING REDUCTION.

APPROACH:

- MAXIMIZE USE OF OPEN SYSTEMS STANDARDS AND COMMON DATA MODELS; PROVIDE HIGH CAPACITY LANS FOR INFORMATION EXCHANGE

TECHNOLOGY TRANSITION VEHICLE:

- TBM RAPID PROTOTYPING, VIA 6.3B TO THE FIELD

OPS/INTEL INTEGRATION ATD PROVISIONAL EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
• INTEGRATE OPS AND INTELLIGENCE INFORMATION	• OBTAINED IN SEPARATE CHANNELS	• INFORMATION COORDINATED AND EXCHANGED IN A TIMELY MANNER	• HIGH CAPACITY LANS FOR INFORMATION EXCHANGE

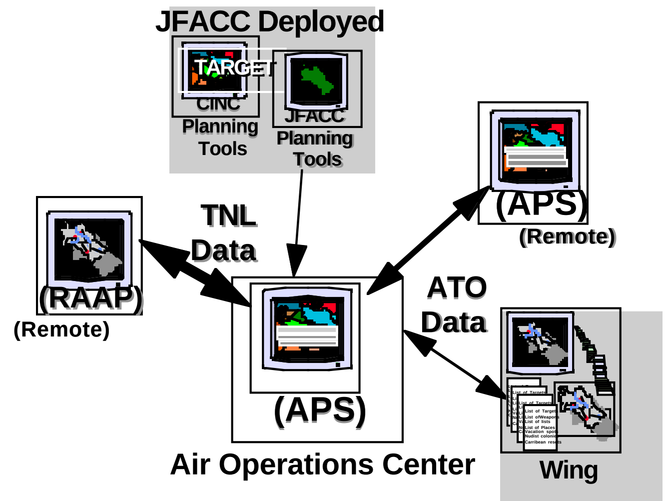
DISTRIBUTED AOC PROTOTYPE

PROBLEM/NEED:

- CURRENT AIR OPS CENTER CENTRALIZED CTAPS COMPLEXITY

USER ADVOCACY:

- ESC/AVB, ACC/DR



MILESTONES:

- REQUIREMENTS ANALYSIS/DESIGN 4/95
- JWID '95 EARLY PROTOTYPE 4/95
- JWID '96 DEMO/TEST 4/96
- ATD 3/97

APPROACH:

- PROTOTYPE OBJECT-ORIENTED AOC BUILD ON CORBA SPECIFICATION

TECHNOLOGY TRANSITION VEHICLE:

- RAPID PROTOTYPING, VIA 6.3B TO THE FIELD

FUNDING ($K):

	FY95	FY96	FY97
63728F	250	600	600

DISTRIBUTED AOC PROTOTYPE PROVISIONAL EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
• AIR OPERATIONS CENTER GEOGRAPHICALLY DEPLOYABLE W/C3 FUNCTIONALITY	• LOSE FUNCTIONS WHEN DEPLOYED	• IMPROVED C3 CAPABILITY	• INTELLIGENCE, PLANNING, AND EXECUTION CELLS NO LONGER NEED TO BE AT SAME LOCATION

USTRANSCOM PLANNING TOOLS ATD

OBJECTIVES:

- AUTOMATED PLANNING WITH INTERLEAVING OF RAPID PLANNING AND PLAN EVALUATION
- MIXED INITIATIVE PLANNING ENABLED BY COMPUTER UNDERSTANDING OF DIALOG AND CONTEXT

TECHNICAL CHALLENGES:

- COMPLETE, CONSISTENT, AND FLEXIBLE PLANS
- HUMAN/COMPUTER COLLABORATION IN PLAN DEVELOPMENT (MIXED INITIATIVE PLANNING)

MILESTONES:

- **ROBUST PLAN ONTOLOGY — JUN 96**
- **INTEGRATED PLNG, TEMPORAL AND UNCERTAINTY REASONING — JUN 96**
- **INTERLEAVED PLANNING AND PLAN EVALUATION — JAN 97**
- **DIALOG BASED PLNG — APR 97**
- **REASON ACTION AGENTS — JAN 98**
- **ROBUST MIXED INIT PLNG — JAN 99**
- **LEARNED ACTION AGENTS — JAN 99**
- **DYNAMIC PLNG AND EXEC MGT — JUN 99**

TASKS/SCHEDULES:

	FY95	FY96	FY97	FY98	FY99
62702F	1.2	1.3	1.0	0.9	0.9
63828F	1.7	2.3	2.0	1.7	1.7
ARPA	6.0	6.0	3.8	3.8	3.8
TOTAL	**8.9**	**9.6**	**6.8**	**6.4**	**6.4**

APPROACH:

- ROBUST PLAN ONTOLOGY AND FORMALISM
- REASONING UNDER UNCERTAINTY
- LEVERAGE CASE-BASED, GENERATIVE, AND DECISION THEORETIC PLANNING
- COMPUTER-BASED SCHEDULING
- LEARNING
- DIALOG-BASED PLANNING
- ADVISABLE PLANNERS

USTRANSCOM PLANNING TOOLS ATD PROVISIONAL EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
• IMPROVED SITUATIONAL MISSION AWARENESS OVER TOTAL BATTLE AREA	• NOT REAL TIME	• INTEGRATED SUITE OF PLANNING AND SCHEDULING TOOLS	• REAL TIME CONCURRENT, DISTRIBUTED, COLLABORATIVE PLANNING BETWEEN SUPPORTED AND SUPPORTING CINCs

B. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION
AND ADVANCED TECHNOLOGY DEMONSTRATION
PROGRAM SUMMARIES
FOR PRECISION FORCE

B. PRECISION FORCE

JPSD PRECISION/RAPID COUNTER-MRL ACTD

OBJECTIVE:

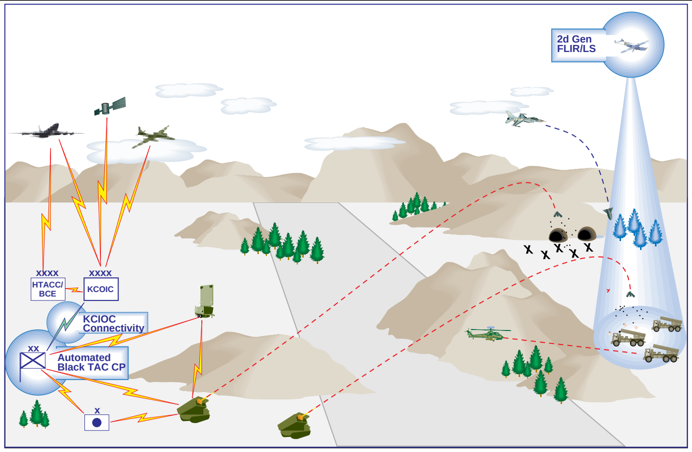
- **DEMONSTRATE AN IMPROVED CAPABILITY, THROUGH CURRENT EMERGING AND ADVANCED TECHNOLOGY, TO DEFEAT A 240 MRL ATTACK AGAINST SOUTH KOREA DURING H TO H PLUS 48 HOURS**
- **PROVIDE LEAVE BEHIND CAPABILITIES**

JUSTIFICATION:

CINC IDENTIFIED REQUIREMENTS TO NEUTRALIZE ATTACK (DSABL)

BATTLELAB:

DEPTH & SIMULTANEOUS ATTACK (DSABL)



SCHEDULE AND FUNDING:

MILESTONE	FY95				FY96				FY97				FY98			
	2Q	3Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
INTEG/SETUP FOR CONUS DEMO																
CONUS DEMO																
INSTALL/ REHEARSE KOREAN DEMO																
KOREAN DEMO																
RESIDUAL CAPABILTY/ SUSTAIN																
FUNDING ($M)																
ARMY	$31.2				$17.5				$1.1				$0.5			
OSD	$ 5.7				16.6				13.3				5.0			
TOTAL	$36.9				$34.1				$14.4				$5.5			

APPROACH:

- **EMPLOY SURVEILLANCE STRATEGY TO CUE NEW TARGET ACQUISITION CAPABILITIES. AUTOMATE AND INTEGRATE TARGETING AND FIRE DIRECTION PROCESS TO DESTROY HIGH VALUE TARGETS IN OPEN AND DENY ACCESS TO PROTECTED POSITIONS**
- **CONDUCT CONUS DEMONSTRATION IN FY 95 AND KOREAN DEMO IN FY 96 EMPLOYING BOTH LIVE AND SIMULATED SYSTEMS AS REQUIRED**
- **ANALYZE DATA AT JPSD INTEGRATION AND EVALUATION CENTER, PUBLISH AFTER ACTION REPORTS LESSONS LEARNED, AND DISTRIBUTE TO COMBAT AND MATERIEL DEVELOPERS.**
- **PROVIDE RESIDUAL CAPABILITY FOR COMMS TO COMBINED OPS INTEL CENTER (COIC), AUTOMATED DEEP OPS COORDINATION CELL.**

APPLICATIONS:

DEEP STRIKE WITH SMART WEAPONS; C3I; UAV

JPSD PRECISION/RAPID COUNTER-MRL ACTD DECISION CRITERIA

THIS ACTD FOCUSES ON THE DETERMINATION OF A MORE EFFICIENT SENSOR-TO-SHOOTER PROCESS TO REDUCE TIMELINES AGAINST A FLEETING TIME-CRITICAL TARGET, THE 240MM MRL. THE OVERALL OBJECTIVE IS TO MAINTAIN FRIENDLY FORCE TIME LINES WHICH ARE WITHIN THE ENEMY'S TIME LINES AND TO CONTROL THE TEMPO OF OPERATIONS . NUMBERS OF MINUTES FOR DECISION CRITERIA 1&2, AND A PERCENTAGE FOR DECISION CRITERIA 3 ARE CLASSIFIED AND HAVE BEEN LEFT BLANK. THEY ARE CONTAINED IN JPSD'S PRECISION/RAPID COUNTER MRL ACTD MANAGEMENT PLAN.

- DEMONSTRATE THE CAPABILITY TO PUT AN MLRS SEEDED MINEFIELD IN PLACE AND OPERATIONAL WITHIN H-HOUR PLUS __ MINUTES.
- DEMONSTRATE THE CAPABILITY TO EXTEND THE 240MM MRL TIMELINE TO __ MINUTES.
- DEMONSTRATE THE ABILITY OF ALTERNATIVE SYSTEMS TO RENDER __ PERCENT OF TARGETED LAUNCHERS COMBAT INEFFECTIVE.

ROTORCRAFT PILOT'S ASSOCIATE ATD

OBJECTIVE:

DEVELOP A COOPERATIVE INTERDEPENDENT MAN/MACHINE SYSTEM THAT USES AND UNDERSTANDS THE VOLUME AND QUALITY OF INTERNAL AND EXTERNAL INFORMATION AVAILABLE TO ACHIEVE MAXIMUM EFFECTIVENESS AND SURVIVABILITY FOR OUR COMBAT HELICOPTER FORCES

- **REVOLUTIONARY MEP TECHNOLOGIES**
- **HIGH SPEED DATA FUSION PROCESSING**
- **COGNITIVE DECISION AIDING EXPERT SYSTEMS**

JUSTIFICATION:

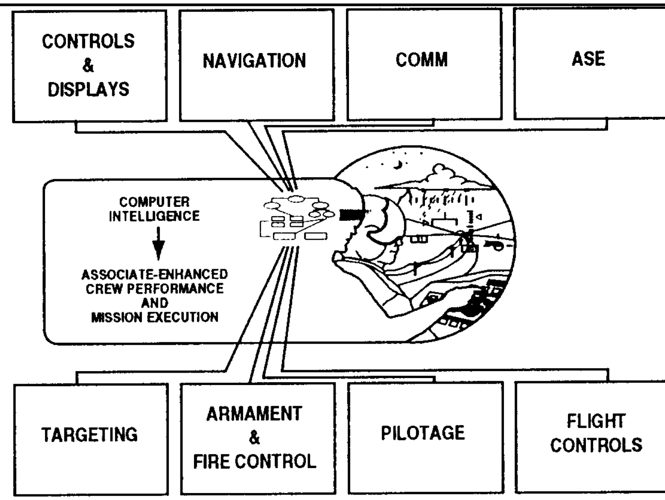
- **REDUCTION IN MISSION LOSSES 30-60%**
- **INCREASE IN TARGETS DESTROYED 50-150%**
- **REDUCTION IN MISSION TIMELINES 20-30%**

BATTLELAB **:**

- **MOUNTED BATTLESPACE**
- **BATTLE COMMAND**

PEO:

- **AVIATION**



SCHEDULE AND FUNDING:

MILESTONES	FY95	FY96	FY97	FY98	FY99
PRELIMINARY DESIGN					
SYSTEM ARCH & SW BUILDS	B 1	2 3 4	5 6		
FMS EVALUATION					
FLIGHT PROGRAM					
CONCURRENT SIMULATION					
PRESENTATIONS TO INDUSTRY					
FUNDING ($M)	**20.3**	**30.2**	**25.9**	**18.3**	**5.3**

APPROACH:

STRUCTURE AN ITERATIVE DEVELOPMENT PROCESS WHICH GATHERS KNOWLEDGE AND USES: RAPID PROTOTYPING TO DEVELOP CDAS SOFTWARE; SIMULATION TO EVALUATE SYSTEM PERFORMANCE; THE KNOWLEDGE FROM THE EVALUATION FEEDS THE NEXT ITERATION.

FY 95-97

- **DESIGN AND DEVELOP CDAS & INTEGRATED SOFTWARE**
- **CONDUCT INITIAL BLWE/ COMBINED ARMS SIMULATION IN DIS**
- **CONDUCT 1ST "OPEN TO INDUSTRY" RPA TECHNOLOGY BRIEFINGS**
- **INITIATE FMS AND FLIGHT TEST EVALUATIONS**

FY 98-99:

- **CONDUCT FMS AND FLIGHT TEST EVALUATIONS**
- **CONDUCT FINAL BLWE/COMBINED ARMS SIMULATION IN DIS**
- **CONDUCT 2ND "OPEN TO INDUSTRY" RPA TECHNOLOGY BRIEFINGS**
- **COMPLETE DATA ANALYSIS AND REPORT**

ROTORCRAFT PILOT'S ASSOCIATE ATD EXIT CRITERIA			
OPERATIONAL CAPABILITY	RAH-66 COMANCHE BASELINE	END ATD	
		MINIMUM (%)	GOAL (%)
SYSTEM LEVEL:			
• Reduction in Mission Losses	1	30	60
• Increased targets destroyed	1	50	150
• Reduction in Mission Timelines	1	20	30
SUBSYSTEM LEVEL:			
• Decrease in Time Exposed to Threat	1	15	30
• Reduction in Blue Losses During Engagement	1	30	80
• Improvement in On-Board Sensors	1	50	100
• Increased INTEL Information for Threat Location	1	50	100
• Improvement in Target Acquisition	1	30	100
• Improvement in Missile Capability	1	30	50
• Improvement in Loss Exchange Ratio	1	30	100
• Reduction in Mission Replanning Time	1	20	50
• Decreased Flight Time to Accomplish Mission	1	12	30
• Improvement in Obstacle/Terrain Detection	1	70	90

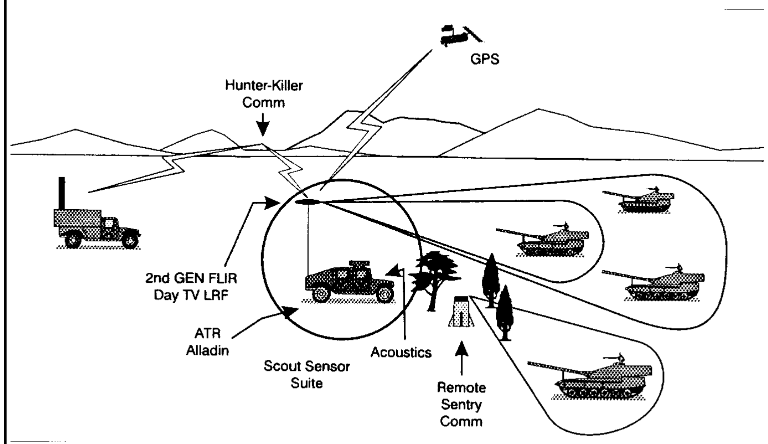
HUNTER SENSOR SUITE ATD

OBJECTIVE:
- DEMONSTRATE A LIGHTWEIGHT, DEPLOYABLE AND SURVIVABLE HUNTER VEHICLE WITH ADVANCED LONG RANGE SENSOR SUITE TO PROVIDE RAPID, MULTIPLE TARGET ACQUISITION & ENHANCED TARGET HANDOFF FOR RFPI NLOS KILLER VEHICLES

JUSTIFICATION:
- IMPROVES SURVIVABILITY
  - LOW OBSERVABLE PLATFORM AND SENSOR PAYLOAD
  - LONG RANGE TARGET ACQUISITION AND SEE FIRST/SHOOT FIRST CAPABILITY
- IMPROVES LETHALITY
  - PRECISION TARGETING FOR INDIRECT FIRE WEAPONS
  - AIDED TARGET RECOGNITION AND PRIORITIZATION
  - FACILITATES BATTLE DAMAGE ASSESSMENT

BATTLELAB:
- DISMOUNTED BATTLESPACE

PEO:
- IEW (SENSORS) (PM NVEO)
- ASM (INTEGRATION)



SCHEDULE AND FUNDING:

MILESTONE	FY93	FY94	FY95	FY96	FY97	FY98
MODELING & SIMULATION						
MAST STUDY						
AWEs						
RFPI EARLY VERSION DEMO						
SENSORS DEVELOPMENT						
DEMO SUITE ON HMMWV						
ALGORITHM MOD/PROCESSOR INTEG						
IMAGE COMP/TRANSFER IMPL						
INTEG/DEMO SUITE HMMWV						
FINAL REPORT						Δ
RFPI EFOG-M ACTD						
FUNDING ($M)		4.4	10.1	14.1	14.6	2.6

APPROACH:
- ON A LOW OBSERVABLE PLATFORM, INTEGRATE 2ND GENERATION THERMAL IMAGING, ACOUSTICS CUEING SENSOR, DAY TV, AND EYESAFE LASER RANGEFINDER TECHNOLOGY, COUPLED WITH MODULAR ATR ALGORITHMS & HIGH DENSITY PROCESSOR TO PRODUCE A LONG RANGE HUNTER SENSOR SYSTEM IN AN OPERATIONAL CONFIGURATION
- COMBINE HIGH ACCURACY POSITION/LOCATION SENSORS, IMAGE COMPRESSION TECHNIQUES, AND SECURE COMMUNICATIONS TO HANDOFF PRECISION TARGETING INFORMATION
- UTILIZE VPS TO EVALUATE HUNTER CONCEPTS AND MAN-MACHINE INTERFACE FUNCTIONALITY
- DEMONSTRATE SYSTEM AS PART OF THE RFPI ACTD
- INCORPORATE IPPD APPROACH TO ADDRESS PRODUCIBILITY & AFFORDABILITY RISKS AND USE STATISTICAL METRICS TO ESTIMATE AND MANAGE ATD SIGMA

APPLICATIONS:
- RFPI UMBRELLA PROGRAM AND RFPI ACTD
- TECH TRANSFER TO LRAS3 & FUTURE SCOUT & COMBAT VEHICLES

HUNTER SENSOR SUITE ATD EXIT CRITERIA				
OPERATIONAL CAPABILITY	CURRENT CAPABILITY	END ATD		TENTATIVE REQUIREMENT E&MD
		MINIMUM	GOAL	
• LONG RANGE, 24 HOUR TARGET ACQUISITION, SURVEILLANCE, & BDA	• AN/TAS-6 W/2X LENS	• 2ND GENERATION SENSOR SUITE	• 2ND GENERATION SENSOR SUITE	• ENHANCED 2ND GEN SENSOR SUITE
- RECOGNITION RANGE [PR, 70%]* (NORMALIZED)	- 1X	- 1.3X	- 1.7X	- 1.7X
• TARGET RECOGNITION	• MANUAL	• AIDED TARGET RECOGNITION	• AIDED TARGET RECOGNITION	• AIDED TARGET RECOGNITION
- FALSE ALARM RATE [PD, ___%]* [PR, ___%]*	- N/A	- 1X/DEG^2	- 5X/DEG^2	- 5X/DEG^2
- TIME TO DETECT	- 100 SEC	- 20 SEC	- 15 SEC	- 15 SEC
• RECEIVE & TRANSMIT TARGETING INFORMATION (VOICE/DATA/IMAGERY)	• NONE	• DATA COMPRESSION RECEIPT & TRANSFER	• DATA COMPRESSION RECEIPT & TRANSFER	• DATA COMPRESSION RECEIPT & TRANSFER
- TRANSMISSION TIME	- N/A	- < 15 SEC	- 10 SEC	- <10 SEC
• PRECISION TARGET LOCATION	• ESTIMATED RANGE	• POSITIONING SENSORS	• POSITIONING SENSORS	• POSITIONING SENSORS
- ACCURACY	- 400-600 M	- 50 M	- 30 M	- 30 M

*Target, Background & Atmospheric Assumptions are specified in Technical SOW

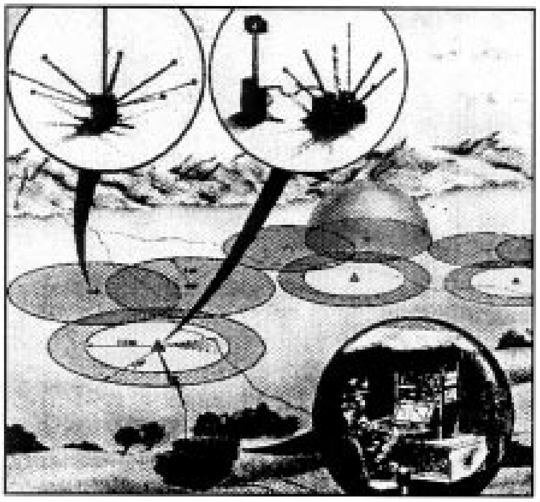
REMOTE SENTRY ATD

OBJECTIVE:
- **DEMONSTRATE UNATTENDED, REMOTELY OPERATED, WIDE AREA GROUND-BASED SURVEILLANCE AND TARGET ACQUISITION DURING DAY/NIGHT AND LIMITED VISIBILITY CONDITIONS**

JUSTIFICATION:
- **KEY ATD IN SUPPORT OF RFPI ACTD**
- **EXTENDS THE SCOUT RANGE AND AREA SURVEILLANCE INCREASED FORWARD SCOUT/OBSERVER SURVIVABILITY THROUGH BATTLEFIELD AWARENESS**
- **REMOTELY CONTROLLED, INTEROPERABLE SENTRIES REDUCE FIELD OF REGARD "BLIND SPOTS"**

BATTLELAB:
- **DISMOUNTED BATTLESPACE**

PEO:
- **IEW (PM-NVEO)**



SCHEDULE AND FUNDING:

MILESTONE	FY93	FY94	FY95	FY96	FY97
MODEL/SIM R/S					
CONTRACT AWD					
DESIGN HDWE					
EARLY FIELD DEMO/AWEs					
EQUIP FAB/TEST					
DELIVERY					
RS ATD DEMO					
DEMO W/HSS ATD					
DELIV TO RFPI ACTD					
RFPI ACTD					
FUNDING: TOTAL $9.2M		**3.6**	**4.5**	**1.0**	

APPROACH:
- **UTILIZE STATE-OF-THE-ART AFFORDABLE, LIGHT WEIGHT SENSORS WITH DATA COMPRESSION AND IMAGE TRANSFER TO PRODUCE A REMOTE AREA SURVEILLANCE AND RECON SYSTEM (SINGLE AND MULTIPLE STATIONS) TO BE TESTED AND DEMONSTRATED AS PART OF RAPID FORCE PROJECTION INITIATIVE ACTD**
- **INCORPORATE IPPD APPROACH TO ADDRESS PRODUCIBILITY AND AFFORDABILITY RISK AREAS. USE STATISTICAL METRICS TO ESTIMATE AND MANAGE ATD SIGMA**

APPLICATIONS:
- **SCOUT PERIMETER SURVEILLANCE**
- **(SINGLE AND MULTIPLE) REMOTE WIDE AREA SURVEILLANCE**
- **TARGET ACQUISITION**
- **BATTLEFIELD DAMAGE ASSESSMENT**
- **SPECIAL OPERATIONS FORCES**

REMOTE SENTRY ATD EXIT CRITERIA

OPERATIONAL CAPABILITY	CURRENT CAPABILITY	END ATD MINIMUM	END ATD GOAL
• 24 Hour, Autonomous, Remote, Surveillance, and Target Acquisition	• Non-Imaging Sensors – 350 m (Nominal)	• Day/Night Imaging – 1100 m Det (Man) 70% P_D – 2200 m Det (Veh) 70% P_D	• Day/Night Imaging – 1300 m Det (Man) – 2500 m Det (Veh) 70% P_D
• Image Compression/ Transmission – Total Duration (via SINCGARS)	• None (Data Only)	• 10 Seconds	• 5 Seconds
• False Alarm Rate	• 1% of Total Alarms/Day	• 1% of Total Alarms/Day	
• Power – Consumption	• Continuous Operation	• Remotely Activated/Cued-Activation	• Remotely Activated/Cued-Activation
– Source	• Line, Vehicle, or Battery	• Battery	• Battery
• Cost (Per Unit) @ 100 Units		• ≤$114.6K	≤ $83.2K

INTELLIGENT MINEFIELD (IMF) ATD

OBJECTIVE

TO INTEGRATE NEW MINE SYSTEMS AND NEW TECHNOLOGIES INTO AN OPTIMIZED, LOGISTICALLY EFFICIENT, AUTONOMOUS ANTI-ARMOR BARRIER AND DEMONSTRATE:

- LONG RANGE SINGLE POINT CONTROL AND RELAY OF TARGET DATA IN SUPPORT OF RFPI
- MINE FIELD ENHANCED PERFORMANCE
- PLANNING AND DECISION AIDS
- PROVIDE ACOUSTIC SENSOR FOR RFPI ACTD

JUSTIFICATION:

- DEMO 50 TO 100% INCREASE IN MINEFIELD EFFECTIVENESS
  - REDUCES LOGISTIC BURDEN OF TRANSPORTATION & DELIVERY
- DEMO UTILITY OF REMOTE CONTROL AND OBSERVATION
  - INCREASE TARGETING INFORMATION RESOURCES
  - PROVIDES MANEUVER FREEDOM
  - ELIMINATES OVERWATCH FORCE
- ENHANCED TARGETING/SITUATIONAL AWARENESS THRU ACOUSTICS

BATTLELAB:

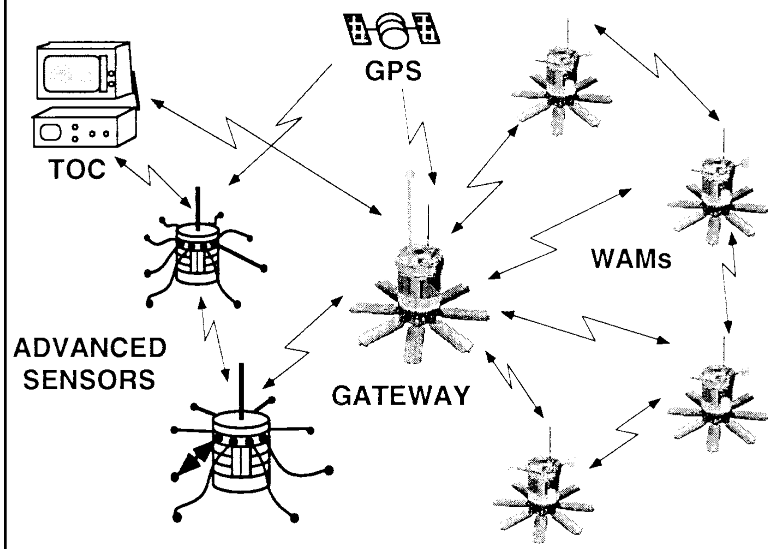
- EARLY ENTRY LETHALITY & SURVIVABILITY (HIGH)
- MOUNTED BATTLESPACE (HIGH)
- DISMOUNTED BATTLESPACE (HIGH)
- DEPTH AND SIMULTANEOUS ATTACK (HIGH)
- MNS AT TRADOC FOR STAFFING
- DEM/VAL & EMD FUNDS IDENTIFIED

PEO:

- ASM (PM-MCD)

SCHEDULE AND FUNDING:

MILESTONE	FY94	FY95	FY96	FY97	FY98	FY99	FY00	FY01
ATD (6.3)	2.3	3.1	3.0					
RFPI SPT (6.3)				2.2				
DEM VAL (6.4)					2.1 (2.1)	2.4 (2.4)	2.4 (2.4)	



APPROACH:

- USER INVOLVEMENT IN CONCEPT DEVELOPMENT AND EVALUATION THRU USE OF COMMON SIMULATION TOOLS
- USE TECHNOLOGY COMMON TO CURRENT MINES AND COMMO SYSTEMS
- USE OPEN ARCHITECTURE TESTBEDS TO EVALUATE HDW CONCEPTS WITH OTHER VIRTUAL ELEMENTS
- FIELD DEMOS WITH USER PARTICIPATION WILL VALIDATE FULL SYSTEM EFFECTIVENESS
- DEVELOPMENT OF DIS COMPATIBLE SIMULATOR

APPLICATIONS:

- WIDE AREA MUNITION (WAM)
- FUTURE MINE & DEMOLITION SYSTEMS
- COUNTERMOBILITY REMOTE CONTROL SYSTEM (CIRCE)
- TARGETING FOR NLOS SYSTEMS
- BATTLEFIELD DIGITIZATION

INTELLIGENT MINEFIELD (IMF) ATD EXIT CRITERIA				
OPERATIONAL CAPABILITY	CURRENT BASELINE (WAM)	MINIMUM	GOAL	PROJECTED EMD REQUIREMENT
GATEWAY CONTROLLER				
MINEFIELD PERFORMANCE	CLASSIFIED	+50%	+100%	+70% - 100%
NUMBER OF SYSTEMS	N/A	1	4	3
RANGE OF CONTROL STATION	N/A	10 KM	30 KM	20-30 KM
CONTROL STATION				
NUMBER OF MINEFIELDS	N/A	2	6	3-6
MCS/ATCCS LINKS	N/A	YES	YES	YES
OVERWATCH SENSOR				
RANGE	0.6-0.8 KM	2-3 KM	3-5 KM	3-5 KM
TARGETS	2	7	15+	8-15

PRECISION GUIDED MORTAR MUNITION ATD

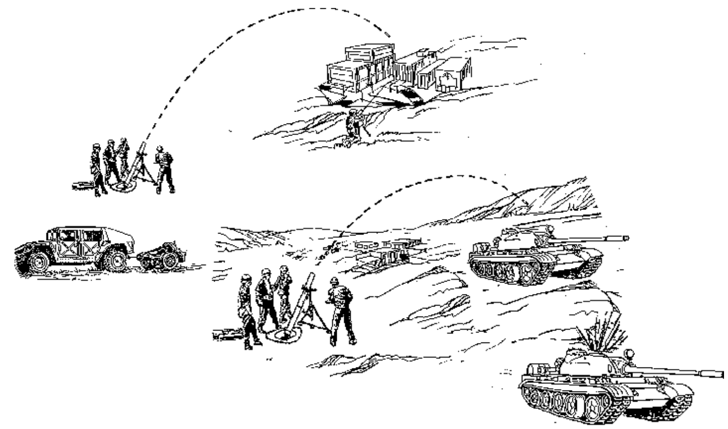
OBJECTIVE:

- DEMONSTRATE PRECISION GUIDED MORTAR CONCEPT UTILIZING ADVANCED SEEKER AND GUIDANCE TECHNOLOGY
- DEMONSTRATE INTEGRATED MANPORTABLE FIRE CONTROL
- COMMON SEEKER FOR 120/105 APPLICATION

JUSTIFICATION:

- EXPANDS CAPABILITY OF MORTARS (10+ KM)
- INCREASED PH AND PK
- POINT TARGET CAPABILITY AT LONG RANGES
- REDUCED FRATRICIDE THROUGH MAN-IN-THE-LOOP
- RAPID, ACCURATE FIRE MISSIONS (2.5 MINUTES, 2 MILS)

PMs: PM-MORTARS ***BATTLE LAB:*** DBBL, EELSBL



SCHEDULE AND FUNDING:

MILESTONES	FY93	FY94	FY95	FY96	FY97	FY98	FY99
FCT	■	■					
EXP DEV	■	■					
MORTAR ATD		■	■	■	■		
ADV CONCEPT						■	■
FUNDING: TOTAL	3.2	3.1	5.4	4.4	5.1	2.7	4.4

APPROACH:

- CONDUCTED FOREIGN COMPARATIVE TESTING (FY94/95)
- EVALUATED U.S. TECHNOLOGY (FY94/95)
- SELECTED TECHNICAL APPROACH (FY95)
- COMPLETE CAPTIVE FLIGHT TESTING (FY95)
- CONDUCT ACTD CFT (FY97)
- MANPORTABLE FIRE CONTROL (FY98)
- 120MM PGMM ATD ALL-UP-ROUND FIRING (FY99)

APPLICATIONS:

- INTEGRAL PART OF RAPID FORCE PROJECTION INITIATIVE (RFPI) TOP LEVEL DEMONSTRATION
- TOP ATTACK SURGICAL KILL CAPABILITY FOR U.S. INFANTRY

PRECISION GUIDED MORTAR MUNITION ATD EXIT CRITERIA			
	BASELINE	**MINIMUM**	**GOAL**
120mm Range (km)	7.2	10.0	12.0
81mm Targets	N/A	Light Armor	MBT
120mm Targets	N/A	MBT	MBT + Bunkers
120mm Weight (lbs)	50.0	40.0	35.0
FC Time to Fire (3 min)	4.0	2.5	0.5
FC Accuracy (mil)	5.0	2.0	1.0
FC Weight (lbs)	N/A	30.0	15.0

ENHANCED FIBER OPTIC GUIDED (FOG) MISSILE ATD

OBJECTIVE

- DEMONSTRATE EFOG-M MULTI-PURPOSE, PRECISION KILL
  - DAY / NIGHT / ADVERSE WEATHER
  - EXTEND MANEUVER COMMANDER BATTLESPACE
  - RANGES UP TO 15 KILOMETERS
- ENGAGE AND DEFEAT
  - ARMORED COMBAT VEHICLES
  - HOVERING OR MOVING ROTARY WING AIRCRAFT
  - OTHER HIGH VALUE GROUND TARGETS

JUSTIFICATION

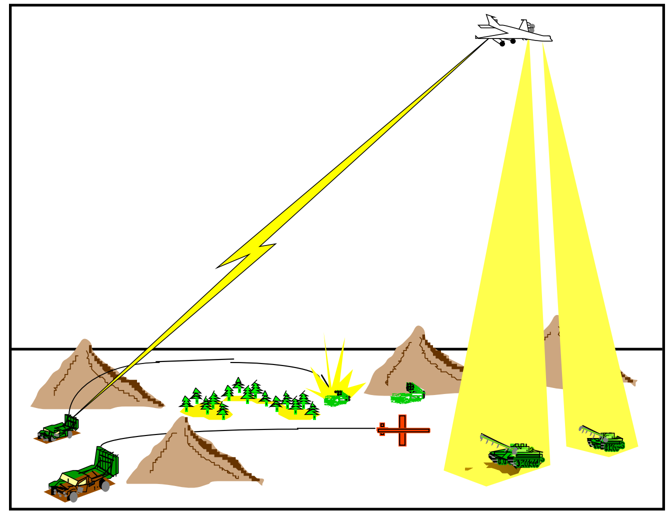
- DAY / NIGHT / ADVERSE WEATHER CAPABILITY
- 15 Km RANGE
- NON-BALLISTIC TRAJECTORY
- POSITIVE VISUAL ID ELIMINATES IFF CASUALTY RISKS
- GPS / INERTIAL NAVIGATION
- C4I COMPATIBLE
- EMBEDDED TRAINING
- GUNNER IN THE LOOP

BATTLELABS

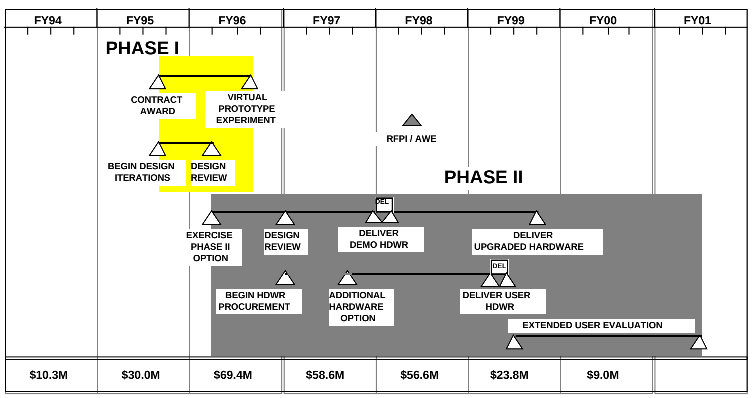
- DISMOUNTED BATTLESPACE BATTLE LAB
- EARLY ENTRY LETHALITY AND SURVIVABILITY BATTLE LAB

PEO

- TACTICAL MISSILES



SCHEDULE AND FUNDING



APPROACH

- CONTRACT AWARDED 16 MAY 95
- BASIC CONTRACT FOR VIRTUAL PROTOTYPE
- PHASED OPTIONS
  - PROTOTYPE HARDWARE / SOFTWARE
  - DEMONSTRATIONS SUPPORT
  - USER TEST SUPPORT
- INTEGRATED PRODUCT AND PROCESS DEVELOPMENT (IPPD)
- NO PLANNED PRODUCTION

APPLICATIONS

- RFPI /AWE ACTD DEMO IN FY98
- EXTENDED USER EVALUATION IN FY99 - FY00

EFOG-M PHASE I EXIT CRITERIA						
EXIT CRITERIA / SIMULATION TYPE	STATIONARY SIMULATOR	MOBILE SIMULATOR	SURROGATE MISSILE	6-DOF	HWIL	BEWSS
PROJECT AND SUSTAIN FORCE						
SYSTEM MISSILE LOAD		X				
SYSTEM MISSILE RELOAD:						
BENIGN CONDITIONS		X				
NBC, NIGHT, ADVERSE WEATHER		X				
SYSTEM RESPONSE TIME-LAUNCH:						
LAUNCH WITHIN 0.5 MINUTES	X	X		X	X	X
CAPABLE OF TWO MISSILES IN FLIGHT	X	X		X	X	X
PROTECT THE FORCE						
MISSION PLANNING AID	X	X				
POSITIVE IDENTIFICATION (RECOGNITION)	X	X	X			
WIN INFORMATION WAR						
MISSILE SEEKER IMAGERY EXPLOITATION:						
RECORD SEEKER VIDEO		X	X		X	
PLT OBSERVE PLATOON VIDEO	X				X	
PLT TRANSMIT VIDEO TO OTHER FUs	X				X	
AUTOMATICALLY RECEIVE TARGET INFO FROM C2	X	X				X
CONDUCT PRECISION STRIKE						
GUNNER CONTROL OF IN-FLIGHT MISSILES						
IN-FLIGHT CORRECTIONS TO FIRST/SECOND MISSILES	X	X	X		X	X
MANUAL SWITCH TO SECOND MISSILE	X	X			X	
RECEIVE/PROVIDE UPDATED TARGET INFO	X	X				X
DOMINATE THE MANEUVER BATTLE						
ENGAGE TARGETS NOT-IN-LOS	X	X	X			X

SURVIVABLE ARMED RECONNAISSANCE ON THE DIGITAL BATTLEFIELD CANDIDATE ACTD

OBJECTIVES:

- **OPTIMIZE THE LINKAGES, TACTICS, TECHNIQUES, AND PROCEDURES AMONG ARMY/JOINT SURVEILLANCE AND RECONNAISSANCE ASSETS.**
- **DETERMINE TRADEOFFS BETWEEN AND COMBINED EFFECTS OF UAVs AND RECONNAISSANCE HELICOPTERS.**
- **EXAMINE THE FULL POTENTIAL OF COMANCHE IN A JOINT RISTA ENVIRONMENT.**

JUSTIFICATION:

ARMY AND JWCA ASSESSMENTS OF RECONNAISSANCE CAPABILITIES SHOW A NEED FOR COUNTER RECONNAISSANCE AND RESPONSIVE TARGETING INFORMATION. DR. KARMINSKI REQUIRED (1) AN ANALYSIS OF THE TRADEOFFS BETWEEN AND COMBINED EFFECTS OF RECONNAISSANCE HELICOPTERS AND UNMANNED AERIAL VEHICLES (UAVs), AND (2) EXAMINATION OF EFFECTIVE METHODS TO LINK COMANCHE TO RISTA PLATFORMS.

SCHEDULE AND FUNDING:

MILESTONE	FY97	FY98	FY99	FY00	FY01
SERVICES OSD/AT	18.6 **TBD**	18.5	23.5	--	--
FUNDING ($M)					

TECHNOLOGY:

- RECONNAISSANCE, TARGETING, HELICOPTER PILOTAGE, AND ROTORCRAFT PILOTS ASSOCIATE TECHNOLOGIES.
- COMBAT IDENTIFICATION TECHNOLOGIES.
- ARMY DIGITIZATION TECHNOLOGIES
- JOINT COMMUNICATION TECHNOLOGIES
- AUTOMATED COMMAND AND CONTROL TECHNOLOGIES
- ADVANCED VISUALIZATION AND SITUATION AWARENESS TECHNOLOGIES (RBV AND BADD)

PLAYERS:

- **ACOM (FORSCOM)**
- **TEC, JPSD, ARPA, TRADOC**
- **OTHER SERVICES**

SCHEDULE:

- **FY97 START — 5-YEAR DURATION — 3 YEARS (DEMOS) — 2 YEARS (LEAVE BEHINDS)**

***STATUS*:**

- **ENDORSED BY TRADOC**
- **COORDINATING WITH RELATED TECHNOLOGY MANAGERS, TRADOC, OTHER SERVICES, AND AGENCIES**

SURVIVABLE ARMED RECONNAISSANCE ON THE DIGITAL BATTLEFIELD CANDIDATE ACTD – DECISION CRITERIA

OPERATIONAL CAPABILITY	BASELINE M1A2 CREW	END ATD		TENTATIVE REQUIREMENT E&MD
		MINIMUM	GOAL	

NAVY

REAL-TIME RETARGETING (RTR) PROGRAM

OBJECTIVE:

- **PROVIDE S&T BASE TO SUPPORT RAPID STRIKE (RE)PLANNING AND EXECUTION FOR CRUISE MISSILE AND TACAIR IN A HIGHLY DYNAMIC TARGET ENVIRONMENT.**

NOT AVAILABLE

SCHEDULE AND FUNDING:

MILESTONE	FY95	FY96	FY97
6.1 RESEARCH	0	3848	4060
6.2 DEVELOPMENT	5133	7275	7410
6.3 DEMONSTRATION	0	4088	4316

CAPABILITY GAPS:

- **MISSION PLANNING SYSTEMS NOT FAST ENOUGH TO ADDRESS TIME CRITICAL TARGETS.**
- **C3 BETWEEN MISSION PLANNING SYSTEMS, SURVEILLANCE ASSETS, TACAIR, AND CRUISE MISSILES IS INADEQUATE OR DOES NOT EXIST.**
- **CAPABILITY DOES NOT EXIST TO UPDATE ATR AND AIM POINT SELECTION AFTER LAUNCH IN RESPONSE TO DYNAMIC TARGETS.**
- **REAL-TIME SUPPORT LACKING FOR ALL-SOURCE TACTICAL INFORMATION PRESENTATION, IN-FLIGHT MISSION REHEARSAL, AND RESOURCE OPTIMIZATION.**

REAL-TIME RETARGETING (RTR) PROGRAM EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
	TO BE PROVIDED		

NAVY

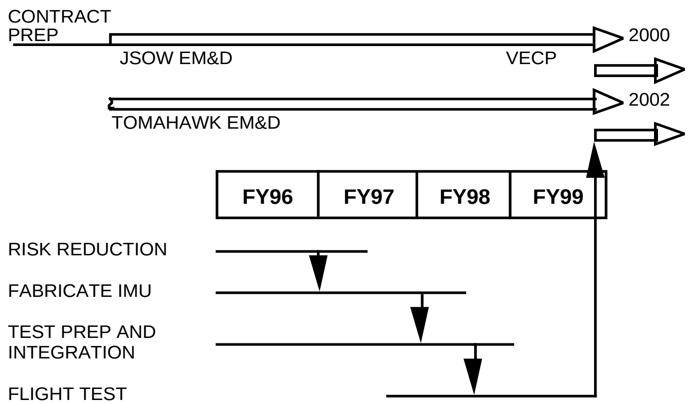
PRECISION STRIKE NAVIGATOR (PSN) ATD*

OBJECTIVE:
- **DEMONSTRATE HIGH ACCURACY FOG IMU ON A HYBRID CHIP USING AWB PIONEERED TECHNOLOGY.**

RISK:
- **ELECTRO-OPTICAL HYBRID INTEGRATION IS A FIRST.**
- **POLARIZING WAVEGUIDE**
- **PHASE MODULATORS**
- **LIFE-OFF PROCESSES**
- **PHOTO-VOLTAICS**

NOT AVAILABLE

SCHEDULE:



FUNDING ($M):

PE Number	FY96	FY97	FY98	FY99
63238N	1.5			
63217N		3.5	4.5	6.0

TECHNICAL APPROACH:
- **DEVELOP FABRICATION PROCESSES FOR THE HYBRID CHIP.**
- **GFE CHIPS TO THE IMU CONTRACTOR.**
- **INSTRUMENT THE IMU INTO A TEST POD.**
- **COLLECT DATA AND CALCULATE CEP.**
- **PREPARE DATA PACKAGE.**

*ATD IN YEAR ONE ONLY

PRECISION STRIKE NAVIGATOR (PSN) EXIT CRITERIA			
OPERATIONAL CAPABILITY	BASELINE	MINIMUM	GOAL
	TO BE PROVIDED		

NAVY

GPS/INERTIAL COMPETENT MUNITIONS ATD

OBJECTIVE:

- **DEMONSTRATE GPS/MICROMECHANICL IMU GN&C WITH DESPUN CANARD ACTUATOR INTEGRATED IN THE NOSE OF A 5" SHELL.**
- **SEVERE LAUNCH ENVIRONMENT**
  - **9.5 MEGAJOULE GUN—30,000 G, 250 HZ ROLL**
  - **18 MEGAJOULE GUN—NEAR 80,000 G**

JUSTIFICATION:

NOT AVAILABLE

SCHEDULE AND FUNDING ($M):

PE Number	FY96	FY97	FY98
63792N	6.0		
63217N		6.0	3.0

APPROACH:

NOT AVAILABLE

GPS/INERTIAL COMPETENT MUNITIONS EXIT CRITERIA

OPERATIONAL CAPABILITY	BASELINE	MINIMUM	GOAL
	NOT AVAILABLE		

CRUISE MISSILE REAL TIME RETARGETING DEMONSTRATION

OBJECTIVE:

- **ADVANCED TECHNOLOGY DEMONSTRATION OF BRASSBOARD REAL-TIME G&C SYSTEM TO LAUNCH ON COORDINATES, MAKE IN-FLIGHT DECISIONS, IDENTIFY TARGETS, AND SELECT AIMPOINTS ON FIXED AND RELOCATABLE TARGETS.**

JUSTIFICATION:

NOT AVAILABLE

SCHEDULE AND FUNDING ($M):

PE Number	FY96	FY97	FY98	FY99	FY00
63217N	4.1	4.3	4.1	4.9	4.5

TECHNICAL ISSUES:

- **INTEGRATE AIMPOINT SELECTION ALGORITHMS WITH LADAR SEEKER AND PREPARE FOR CAPTIVE-CARRY ON F/A-18 OR F-15.**
- **DEVELOP REAL-TIME PROCESSOR USING OFF-THE-SHELF COMPONENTS TO PERFORM MISSION PLANNING, IMAGE PROCESSING, AND GUIDANCE DECISIONS.**

CRUISE MISSILE REAL-TIME RETARGETING DEMONSTRATION EXIT CRITERIA			
OPERATIONAL CAPABILITY	BASELINE	MINIMUM	GOAL
	NOT AVAILABLE		

NAVY

CRUISE MISSILE DEFENSE, PHASE I (MOUNTAIN TOP)

OBJECTIVES:

- **DEMONSTRATE AIR-DIRECTED SURFACE-TO-AIR MISSILE (ADSAM) OVER-THE-HORIZON ENGAGEMENT**
- **USING ELEVATED SENSORS AS A SURROGATE AIR PLATFORM, DETECT, TRACK, ENGAGE, AND KILL OVER-THE-HORIZON CRUISE MISSILE TARGETS.**

USE MOUNTAIN TOP SENSORS (RSTER, MK 74 MFCS, CEC) AS SURROGATE AIRBORNE PLATFORM.

- **PROVIDE INSIGHTS INTO NEW AIR DEFENSE CONCEPTS OF OPERATIONS.**
- **JOINT NAVY/ARMY DEMONSTRATION WITH JOINT STAFF AND ALL SERVICE MODELING AND SIMULATION SUPPORT.**

RESIDUALS:

- **NONE IN PHASE I**

NOT AVAILABLE

SCHEDULE:

- **06-26 JAN 96: ARMY "VIRTUAL ENGAGEMENTS" MISSIONS (SIMULATED FIRING ON TRACK DATA.).**
- **20-21 JAN 96: NAVY LIVE MISSILE FIRING TESTS.**
- **29 JAN–2 FEB 96: MOUNTAIN TOP ENHANCED JOINT EXERCISE (LITTORAL WARFARE AND DATA COLLECTION)**

FUNDING ($M):

PE Number	FY95	FY96	FY97	FY98	FY99
63238N	26.7	46.9	46.3	31.6	12.3

NOTE: TOTALS OF PHASES I AND II

TECHNOLOGY:

- **EXISTING SURVEILLANCE AND FIRE CONTROL SENSORS (RADAR SURVEILLANCE TECHNOLOGY EXPERIMENTAL RADAR (RSTER) WITH ADS-18S ANTENNA, MK 74 MISSILE FIRE CONTROL SYSTEM, AEGIS, PATRIOT RADAR).**
- **COOPERATIVE ENGAGEMENT CAPABILITY (CEC).**
- **MODIFIED STANDARD MISSILE (SM-2, BLK III).**
- **CAPTIVE CARRY PATRIOT PAC-3 MISSILE SEEKER.**

PLAYERS:

- **USERS: CINCPAC; SERVICE DOCTRINE COMMANDS; U.S. ARMY AIR DEFENSE ARTILLERY SCHOOL**
- **S&T MANAGERS:**
  - **NAVY: ONR, PEO(TAD), PMS 400 (AEGIS)**
  - **ARMY: PEO(MD), PATRIOT**
- **OTHERS: USAF, USMC, JOINT STAFF, BMDO, ARPA (PLANNING, SIMULATION, CONOPS, DATA COLLECTION)**

CRUISE MISSILE DEFENSE, PHASE I (MOUNTAIN TOP) EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
	NOT AVAILABLE		

HARD TARGET SMART FUZE (HTSF) ATD

OBJECTIVES/GOALS:

- MATURE, DEMONSTRATE, AND REDUCE OVERALL RISK OF PRODUCIBLE, TACTICAL BASELINE SMART FUZE.
- INTEGRATE HTSF WITH MMT.
- DEMONSTRATE OPERATIONAL UTILITY OF HTSF.

PAYOFF/MILITARY SIGNIFICANCE:

- SUPPORTS C.P. OF WMD.
- INCREASED SORTIE EFFECTIVENESS AND REDUCED COLLATERAL DAMAGE.
- STREAMLINED ACQUISITION CYCLE.

NOT AVAILABLE

KEY MILESTONES:

- ASSEMBLY LINE FACILITIZED 2Q96
- OPERATIONAL UTILITY EVALUATION 2Q96
- CPI PHASE I DEMO 2Q96
- COMPLETE QUAL 3Q96
- FAB/DELIVER 70/16 UNITS 3Q96

FUNDING ($M):

PE Number	FY95	FY96	TOTAL
606601F, PROJ. 670B	3.3	1.9	5.2

PAST ACCOMPLISHMENTS:

- PRODUCIBLE TACTICAL DESIGN.
- 16 SUCCESSFUL SLED TESTS
- 7 SUCCESSFUL FLIGHT TESTS
- CRITICAL ENVIRONMENTAL QUALITY TESTS
- CONTRACT AWARD—JULY/SEP 95

HARD TARGET SMART FUZE (HTSF) ATD EXIT CRITERIA

OPERATIONAL CAPABILITY	BASELINE	MINIMUM	GOAL
	NOT AVAILABLE		

AIR FORCE

ANTIMATERIEL WARHEAD FLIGHT TESTS (AWFT) ATD

OBJECTIVES/GOALS:

- **DEMO MULTI-MODE WARHEAD IN FLIGHT TEST**
  - **AEROSTABLE SLUG**
  - **STRETCHING ROD**
  - **FRAGMENTS**
- **DEMO LADAR SENSOR**
  - **DETECT, CLASSIFY, TRACK**
- **DEMO SUBMUNITION MANEUVER PERFORMANCE**

NOT AVAILABLE

PAYOFF/MILITARY SIGNIFICANCE:

- **LOW COST/KILL—5 TO 1 IMPROVEMENT**
- **EFFECTIVE MUNITION—SEAD, TMD, JSASM TARGETS, ETC.**

KEY MILESTONES/TRANSITION:

- **COMPLETE WARHEAD/SUBMUNITION INTEGRATION DESIGN** **3Q97**
- **FABRICATE HARDWARE** **3Q98**
- **GROUND TESTING** **1Q99**
- **FLIGHT TESTING** **3Q99**
- **TRANSITION** **4Q99**
  –> SUPPRESSION OF ENEMY AIR DEFENSE (SEAD) WEAPON

FUNDING ($M):

PE NUMBER	FY95	FY96	FY97	FY98	FY99	FY00	TOTAL
63601F, Proj. 670A	0.5	0.5	2.0	4.4	4.1	0.7	12.0

ACCOMPLISHMENTS:

- **SENSOR PROVED IN TOWER AND FLIGHT TESTS** **1QFY94**
- **GUIDED FLIGHT TEST (NO WARHEAD)** **4QFY94**

ANTIMATERIEL WARHEAD FLIGHT TESTS (AWFT) ATD EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
	NOT AVAILABLE		

AIR FORCE

ANTIJAM GPS TECHNOLOGY FLIGHT TEST (AGTFT) ATD

OBJECTIVES:

- IDENTIFY AND FLIGHT TEST LOW COST ANTIJAM CAPABILITY FOR JDAM TYPE WEAPONS
  - LAB AND ANECHOIC CHAMBER TESTING OF EXISTING OR NEAR-TERM DEVELOPMENTAL ANTIJAM CAPABILITY
  - INTEGRATE AJ TECHNOLOGY INTO SUITABLE CARRIER VEHICLES
  - CONDUCT AJ GPS/INS FLIGHT TEST AT HOLLOMAN AFB, NM

PAYOFF/MILITARY SIGNIFICANCE:

- ANTIJAM CAPABILITY PERMITS GPS ACCURACY FROM WEAPON LAUNCH TO IMPACT
- INCREASED ACCURACY AND EFFECTIVENESS REDUCES NUMBER OF AIRCRAFT SORTIES REQUIRED

NOT AVAILABLE

KEY MILESTONES/TRANSITION:

- COMPLETE SUBSYSTEM TESTING 2Q96
- COMPLETE INTEGRATION 2Q97
- COMPLETE GROUND TESTING 4Q97
- COMPLETE FLIGHT TESTING 2Q98
- TRANSITION TO JDAM PIP 1Q99

FUNDING ($M):

PE NUMBER	FY95	FY96	FY97	FY98	FY99	TOTAL
6.3, 63601F, Proj. 670A	0.8	2.9	2.8	3.1	0.0	9.5
6.4, 63601F, Proj. 670A	0.9	1.7	2.0	0.04	0.0	4.7

ACCOMPLISHMENTS:

- SPATIAL/TEMPORAL DISCRIMINATION OF JAMMER 2Q93
- THAGG HARDWARE FABRICATED 4Q94

ANTIJAM GPS TECHNOLOGY FLIGHT TEST (AGTFT) ATD EXIT CRITERIA			
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
	NOT AVAILABLE		

C. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION AND ADVANCED TECHNOLOGY DEMONSTRATION PROGRAM SUMMARIES FOR COMBAT IDENTIFICATION

C. COMBAT IDENTIFICATION

BATTLEFIELD COMBAT IDENTIFICATION (BCID) ATD

OBJECTIVE:

IMPROVE COMBAT EFFECTIVENESS AND SUBSTANTIALLY REDUCE FRATRICIDE

PHASE I DEMO:

- **DEMONSTRATE A FULLY DIGITIZED SA/TARGET ID CAPABILITY AT PLATFORM LEVEL WITHIN A DIGITIZED BDE**
- **DEMONSTRATE EXTENSION OF BCIS TO AIR-TO-GROUND**
- **DEMONSTRATE JOINT/ALLIED INTEROPERABILITY**

PHASE II DEMO:

- **DEMONSTRATE ADVANCED CONCEPTS FOR A FULLY DIGITIZED, FRIEND, FOE AND NEUTRAL TARGET ID/TARGET ACQUISITION/SA CAPABILITY INTEGRATED WITHIN A DIGITIZED DIV**

JUSTIFICATION:

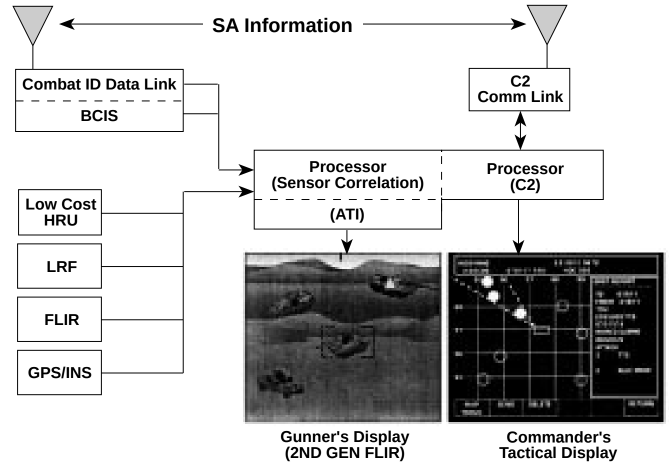
- **BATTLEFIELD COMBAT ID ORD/TRADOC OPS CONCEPT**

BATTLELAB:

- **MOUNTED BATTLESPACE**
- **DISMOUNTED BATTLESPACE**

PEO:

- **PEO IEW (PMCI)**



SCHEDULE AND FUNDING:

MILESTONE	FY93	FY94	FY95	FY96	FY97	FY98
STUDY PHASE	Concepts and Technical Options					
SIMULATION/ MODELING PHASE	Develop Tools, Models, and Scenarios			Force on Force Runs		
HW DEVELOPMENT PHASE		CI Hardware Testbed	Demonstrators Developed		MS Decision	DEM VAL or EMD
DEMO PHASE			DWBL AWE, MWBL AWE	Phase I Demo	HTI AWE	Phase II Demo
FUNDING ($M)	2.8	6.0	8.3	6.8	7.1	3.4

APPROACH:

FY96

ENHANCED BCIS

- **PERFORMANCE ENHANCEMENTS**
- **INTEROPERABILITY**
- **PLATFORM EXTENSIONS**

SITUATIONAL AWARENESS

- **BCIS DIGITAL DATA LINK**
- **DATA CORRELATION (BCIS/ESA/CAC2)**
- **DISPLAY THRU TA SIGHT**
- **DISPLAY ON COMMANDER'S TACTICAL DISPLAY**

FY98

TARGET ID

- **LPD EMBEDDED SIGNATURE**
- **DISMOUNTED SOLDIER**

TARGET ACQUISITION

- **ATI (FLIR AND MULTISENSOR)**
- **IMPROVED FLIR OPERATOR ID PERFORMANCE**

ENGAGEMENT SA

- **DISMOUNTED SOLDIER**

APPLICATIONS:

- **ALL US, NATO AND POTENTIAL COALITION COMBAT, COMBAT SUPPORT AND COMBAT SERVICE SUPPORT SYSTEMS**

BATTLEFIELD COMBAT IDENTIFICATION (BCID) (1996) EXIT CRITERIA*					
OPERATIONAL CAPABILITY	**CURRENT BASELINE**	**NEAR-TERM BASELINE**	**ATD MINIMUM**	**ATD GOAL**	**EMD**
Target Identification					
• Equipment	1st Gen FLIR, 2nd & 3rd Gen I^2, DVO, "Budd" Lights, CID Boards	BCIS	Enhanced BCIS, 2nd Gen FLIR	Enhanced BCIS, 2nd Gen FLIR	Enhanced BCIS, 2nd Gen FLIR
• PID (Friendly Ground Vehicles)	Limited by Multiple Factors	90%	98%	99%	98%
• Range	Limited by Resolution and Weather	1.5 X Weapon EFF Range	1.5 X Weapon EFF Range	1.5 X Weapon EFF Range	1.5 X Weapon EFF Range
Situational Awareness					
• Position Correlation Method	Manual Reporting	Manual Reporting	Automatic (Using BCIS DDL)	Automatic (Using BCIS DDL & CAC2)	Automatic (Using BCIS DDL & CAC2)
• Continuous Correlation Accuracy	~500 Meters	~500 Meters	100 Meters	50 Meters	≤100 Meters
Army Platform Extension	Ground Vehicles (Limited Capability)	Ground Vehicles (BCIS)	Add Rotary Wing Aircraft	Add Rotary Wing Aircraft	Add Rotary Wing Aircraft
Joint Interoperability	None	None	Fixed Wing Aircraft	Fixed Wing Aircraft	Fixed Wing Aircraft

*Operational demonstration with TFXXI in FY97.

BATTLEFIELD COMBAT IDENTIFICATION (BCID) (1998) EXIT CRITERIA				
OPERATIONAL CAPABILITY	**MID-TERM BASELINE**	**ATD MINIMUM**	**ATD GOAL**	**EMD**
Target Identification				
• Cooperative (Friends)	BCIS Q & A	Integration with 2nd Gen FLIR	Integration with 2nd Gen FLIR	Integration with 2nd Gen FLIR
• Non-cooperative (Foe & Neutrals)	2nd Gen FLIR (Manual)	2nd Gen FLIR ATI /BCIS Correlation	2nd Gen FLIR ATI /BCIS Correlation	2nd Gen FLIR ATI /BCIS Correlation
- ID Time	1 X	0.3 X	0.1 X	0.1 X
- PID	80%	95% Min	99% Min	95% Min
Platform Extension	Ground Vehicles and Aircraft	Add Dismounted Soldiers	Add Dismounted Soldiers	Add Dismounted Soldiers

JOINT COMBAT IDENTIFICATION ACTD

OBJECTIVE: INCREASE COMBAT EFFECTIVENESS AND REDUCE FRATRICIDE

DEMONSTRATE A JOINT, INTEGRATED AIR-TO-GROUND AND GROUND-TO-GROUND COMBAT IDENTIFICATION CAPABILITY

- **QUANTIFY THE CONTRIBUTIONS OF SELECT IDENTIFICATION TECHNOLOGIES TO REDUCE FRATRICIDE AND INCREASE COMBAT EFFECTIVENESS**
- **SUPPORT A COST AND OPERATIONAL EFFECTIVENESS ANALYSIS (COEA) THROUGH ASSESSMENT OF MEASURES OF PERFORMANCE (MOPs) AND MEASURES OF EFFECTIVENESS (MOEs) FROM BOTH EXERCISES AND SIMULATIONS**

REFINE INTER/INTRA-SERVICE TACTICS, TECHNIQUES, AND PROCEDURES

LEVERAGE THE INVESTMENT IN THE DIGITIZED BATTLEFIELD INITIATIVE TO EXPLORE SYNERGISM BETWEEN SA AND TI

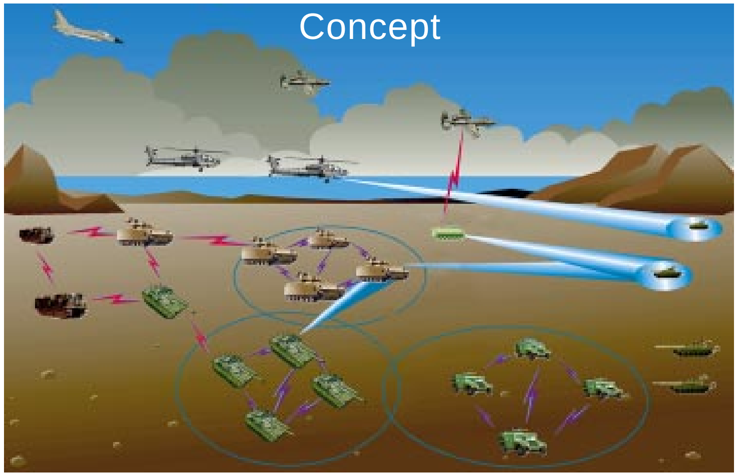
PROVIDE A "LEAVE BEHIND" CAPABILITY FOR AN OPERATIONAL FORCE

JUSTIFICATION:

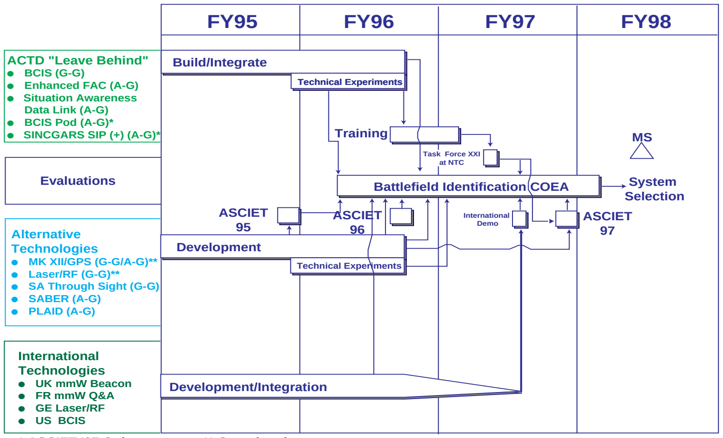
•JROC MNS, 26 MAR 92

SPONSOR:

CINC, ATLANTIC COMMAND



SCHEDULE AND FUNDING:



*** ASCIET '97 Only** **** Completed**

FY96–FY98

TARGET ID

- **PERFORMANCE**
- **INTEROPERABILITY**
- **ADDED GROUND PLATFORMS**
- **AIR PLATFORM**
- **ALLIED INTEROPERABILITY**

SITUATIONAL AWARENESS

- **DIGITAL DATA LINK**
- **DATA CORRELATION**
- **HEADS UP DISPLAY**
- **DISPLAY ON COMMANDER'S TACTICAL TERMINAL**

JOINT COMBAT IDENTIFICATION ACTD DECISION CRITERIA

OPERATIONAL CAPABILITY	BASELINE	IMPROVEMENT	ACTD GOAL
Target Identification • Cooperative (Friends)	G-G BCIS Q & A	A-G Q & A	A-G Q & A
• Non-cooperative (Foe & Neutrals)	2nd Gen FLIR	FW A-G	FW A-G
- ID Time - PID	Several Seconds ~80%	90% <2.3 Secs A-G 90% <1.0 Sec G-G	90% <1 Sec All
• **Range**	Limited by Resolution and Weather	1.0 X Weapon EFF Range	1.5 Weapon EFF Range
Platform Extension	Ground Vehicles	Rotary Wing, Fixed Wing Aircraft, FAC	Rotary Wing, Fixed Wing Aircraft, FAC
Situational Awareness	Manual	Integrated	Automatic, Integrated
Joint Interoperability	None	Yes	Yes
Allied Interoperability	None	No	Yes
Loss Exchange Ratio	Measured at ASCIET 96		2X ASCIET 96
Fratricide	Measured at ASCIET 96		0.5X ASCIET 96

ADVANCED IDENTIFICATION ATD

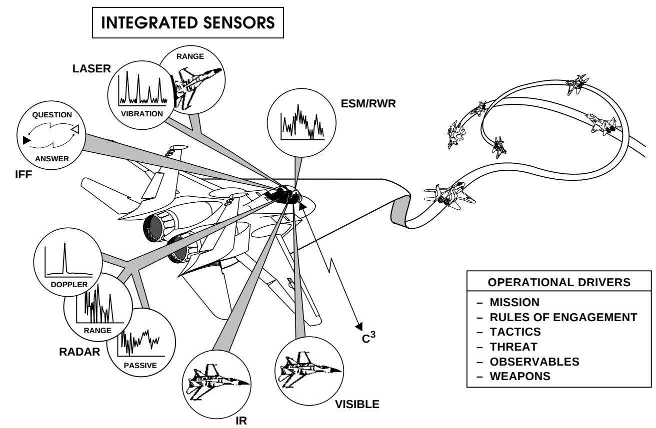
OBJECTIVE:

- **DEVELOP/DEMONSTRATE NEXT GENERATION ATR FOR MULTIPLE DoD MISSION APPLICATIONS**
  - **MULTI-SENSOR/MULTI-FEATURE FUSION ALGORITHM DEVELOPMENT**
  - **MODEL-DRIVEN ATR DEVELOPMENT**
  - **PHENOMENOLOGY EXPLOITATION**
- **PROVIDE ENHANCED AIR-TO-AIR AND AIR-TO-GROUND CAPABILITY FOR NEXT GENERATION FLEET**
- **DEVELOP CAPABILITY AGAINST ADVANCED THREATS**

APPROACH:

- **LEVERAGE INVESTMENT IN ATAD AND MSTAR PROGRAMS**
- **PHASE I—DEMO FEATURE-BASED ATR FOR AIR TARGETS ON CURRENT FIGHTERS**
- **PHASE II—DEMO MODEL-DRIVEN ATR FOR GROUND TARGETS**
- **PHASE III—DEMO FEATURE-BASED ATR FOR AIR TARGETS ON NEXT GENERATION FIGHTERS**

Combat ID of the Future



MILESTONES:

PHASE I: **FY95 ALGORITHM DEVELOPMENT & FORMAL LAB TEST**
FY98 FLIGHT DEMO BEGINS (4TH QUARTER)
FY99 6.3B INSERTION PROGRAM (4TH QUARTER)

PHASE II: **FY96 ALGORITHM AND SIGNATURE DEVELOPMENT**
FY97 ALGORITHM EXPANSION AND ISSUES, DEVELOP DEMO PLANS AND PROCEDURES
FY98 FLIGHT DEMO TECHNOLOGY

PHASE III: **FY00 ADVANCED FUSION DEMO DESIGN COMPLETE**
FY02 DEMO HARDWARE AND SOFTWARE
FY03 DEMO COMPLETE, TRANSITION TECHNOLOGY

FUNDING ($M):

FY96	FY97	FY98	FY99	FY00	FY01	FY02
0.55	1.4	1.7	2.4	2.4	3.6	3.6

REQUIREMENT THRESHOLDS:

- **TIMELY, ACCURATE ID SOLUTION FOR AIR AND GROUND TARGETS**
- **EXPANDABLE TARGET SET**
- **MISSION/COUNTERMEASURE ROBUSTNESS**

ISSUES—

- **COMPUTATIONAL LIMITATIONS**
- **TARGET MODEL FIDELITY**

PAYOFF—

- **LONG RANGE, HIGH CONFIDENCE, ALL ASPECT ID**
- **ENHANCED MISSION EFFECTIVENESS, MINIMIZED FRATRICIDE**
- **JAM RESISTANCE**

ADVANCED IDENTIFICATION ATD – PHASE I EXIT CRITERIA				
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**	**EMD**
P_{DEC}		0.85	0.85	0.85
P_{CONF}		0.98	0.99	0.99
Target Set Size		10 Targets	20 Targets	50 Targets

ADVANCED IDENTIFICATION ATD – PHASE II EXIT CRITERIA				
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**	**EMD**
P_{DEC}		0.80	0.85	0.85
P_{CONF}		0.95	0.98	0.99
Target Set Size		5 Targets	10 Targets	20 Targets

ADVANCED IDENTIFICATION ATD – PHASE III EXIT CRITERIA				
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**	**EMD**
P_{DEC}		0.85	0.85	0.85
P_{CONF}		0.98	0.99	0.99
Target Set Size		10 Targets	20 Targets	50 Targets

NOTE: P_{DEC} = Probability of Declaration
P_{CONF} = Probability of Confirmation

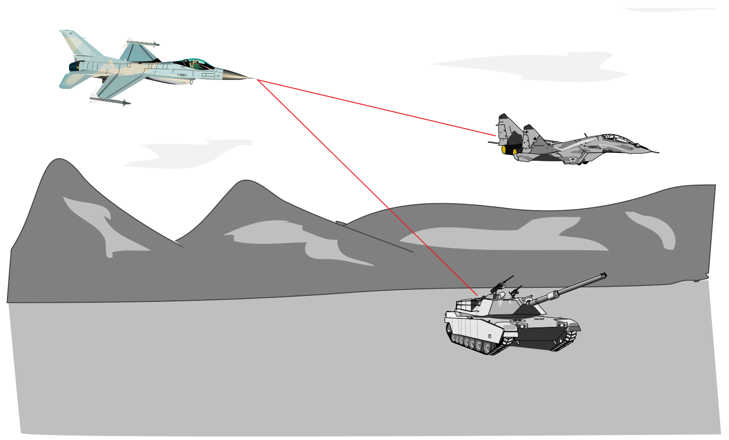
ENHANCED RECOGNITION AND SENSING LADAR (ERASER)

OBJECTIVE:

- **DEVELOP, EVALUATE, AND DEMONSTRATE IN AN EXISTING POD (LANTIRN) ADVANCED LASER TECHNOLOGIES THAT PROVIDE PILOTS WITH POSITIVE, TIMELY, AND RELIABLE ID INFORMATION**
  - **AIR-TO-AIR AND AIR-TO-GROUND MISSIONS**
  - **COOPERATIVE AND NON-COOPERATIVE TECHNIQUES**

APPROACH:

- **INTEGRATE EXISTING IR DETECTION SENSOR AND FIRE CONTROL HAND-OFF SYSTEM WITH LASER ID SENSOR AND ALOGRITHMS INTO AN EXISTING POD**
- **EXPLOIT 1-D LASER RANGE PROFILE FOR AIR-TO-AIR**
- **EXPLOIT 2-D/3-D LASER PROFILES FOR AIR-TO-GROUND**



MILESTONES:

- **FY95—1D, 2D EXPERIMENTS/DATA COLLECTION**
- **FY96—ALGORITHM EVALUATION, EXTENDED RANGE TESTS**
- **FY97—CONTRACT AWARD**
- **FY00—ROOFTOP DEMONSTRATIONS**
- **FY01—DESIGN REVIEWS, SYSTEM DEVELOPMENT**
- **FY03—FLIGHT TEST**

FUNDING ($M):

FY95	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03
0.7	0.3	0.3	1.3	2.7	3.3	3.0	3.0	2.5

REQUIREMENT THRESHOLDS:

- **PROVIDE POSITIVE, TIMELY, AND RELIABLE ID INFORMATION FUSION COMPATIBLE WITH EXISTING ID/IFF TECHNIQUES**
- **SUPPORT AIR-TO-AIR MISSILE LAUNCH AT 60-80 KM**
- **SUPPORT AIR-TO-GROUND WEAPON LAUNCH AT 15-25 KM**
- **PROB OF DECLARATION = 85% / ID CONFIDENCE = 99%**

ISSUES—

- **AFFORDABLE SOLUTIONS - P3I POTENTIAL**
- **WEATHER LIMITATIONS; EYE-SAFE REQUIREMENTS**
- **COOPERATIVE/NON-COOPERATIVE COMPLEXITY**

PAYOFFS—

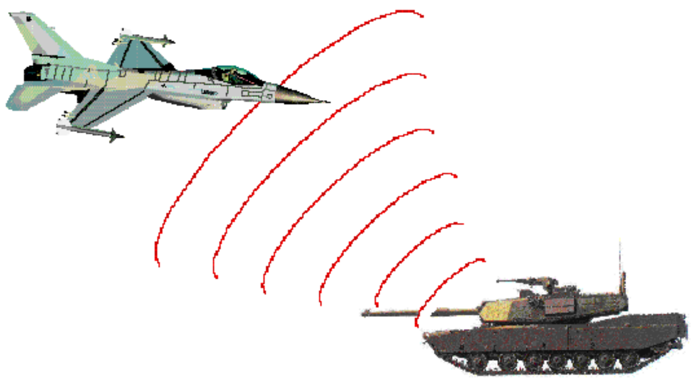
- **MINIMIZE FRATRICIDE, IMPROVE MISSION EFFECTIVENESS**
- **LPI OPERATIONS; IMPROVE CAPABILITY VERSUS LO TARGETS**

ENHANCED RECOGNITION AND SENSING LADAR (ERASER) EXIT CRITERIA				
OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**	**EMD**
A-A Missile Launch		60 km	80 km	
A-G Weapon Launch		15 km	25 km	
PDec		85%		
PCon		99%		

POSITION LOCATION AND IDENTIFICATION (PLAID) ATD

DESCRIPTION:

- **USAF SYSTEM USES PASSIVE TECHNIQUES TO ID TARGETS**



POTENTIAL ISSUES:

- **PROBABILITY OF ID—REQUIRES TARGETS TO EMIT**
- **MISSION AREA SUITABILITY—REQUIRES COMPATIBLE EMITTER EQUIPMENT ON GROUND PLATFORMS FOR GROUND-TO-GROUND ID**

ADVANTAGES:

- **PROVIDE POSITIVE, TIMELY, AND RELIABLE ID INFORMATION CAN PROVIDE FOE ID FOR AIR-TO-GROUND**
- **TECHNOLOGY ALREADY IN USE ON FIXED WING**

POSITION LOCATION AND IDENTIFICATION (PLAIN) ATD EXIT CRITERIA				
OPERATIONAL CAPABILITY	**BASELINE**	**ACTD MINIMUM**	**ACTD GOAL**	**EMD**

CLASSIFIED PROGRAM

POC: MR. P. AARON LINN
WL/AAWD
Wright Patterson AFB, OH 45433
Phone: 513-255-7984

SPECIFIC EMITTER IDENTIFICATION (SEI)

OBJECTIVE:

- **UNIQUELY IDENTIFY EMITTERS (AND THEIR PLATFORMS) USING AN EMITTER'S SEI "FINGERPRINT" DERIVED FROM SEI SIGNAL PARAMETER/ CHARACTERIZATION PROCESS.**

TECHNICAL APPROACH:

- **RECORD SIGNAL'S INTRAPULSE AMPLITUDE, PHASE, AND FREQUENCY CHARACTERISTICS TO CREATE A MATHEMATICAL REPRESENTATION OF THE EMITTER'S FREQUENCY VARIATION OR UMOP(UNINTENTIONAL FREQUENCY MODULATION ON PULSE) SIGNATURE**
- **COMPARE SIGNATURES TO WORLDWIDE LIBRARY FOR MATCH AND SUBSEQUENT ID.**

YEARS

Current Baseline	5 (2001)	10 (2006)	15 (2011)
SEI Prototypes; P-3/MERSHIP Tracking Sys	MMIC Tech Units (10:1 size reduce); Combat ID; TACAIR SEI Insertion	AIEWS; Advanced ESM Sys (ALR-XX)	Weapon Embedded SEI

TECHNOLOGY TIMELINE

FUNDING ($K):

	FY96	FY97	FY98	FY99	FY00	FY01
6.2	975	800	900	900	950	950
6.3A	855	950	720	350	350	350

STATUS/ISSUES:

MILESTONES—

- **CONCEPT TESTING COMPLETED BY AIR, SURFACE, AND LANDBASED SITES**
- **LIBRARY ENTRY FORMAT STANDARDIZED—CURRENTLY CONTAINS OVER 10,000 ENTRIES**
- **TECHNOLOGY PROTOTYPE UNITS OPERATIONALLY DEPLOYED ABOARD T-AGOS, ES-3A, DDG, EP-3E, P-3C, SSN**

TECHNOLOGY ISSUES—

- **AUTOMATED SIGNATURE MATCHING TASK CONTINUES**
- **IMPROVED PROCESSING TECHNIQUES FOR PARAMETER EXTRACTION TASK CONTINUES**
- **MINIATURIZATION OF SYSTEM TO INCREASE EMPLOYMENT FLEXIBILITY AND UTILIZATION**
- **DEVELOP MMIC SEI RECEIVER**

SPECIFIC EMITTER IDENTIFICATION (SEI) DECISION CRITERIA

NAVY

OPERATIONAL CAPABILITY	BASELINE	MINIMUM (5 YRS)	GOAL	EMD
Emitter Identification	SEI Prototypes; P-3/ MERSHIP Tracking System	MMIC Tech. Units (10:1 size reduction), TACAIR SEI Insertion	AIEWS; Advanced ESM System (Production MMIC Units)	Weapon-Embedded SEI

PRECISION TARGETING IDENTIFICATION (PTI) PROPOSED ACTD

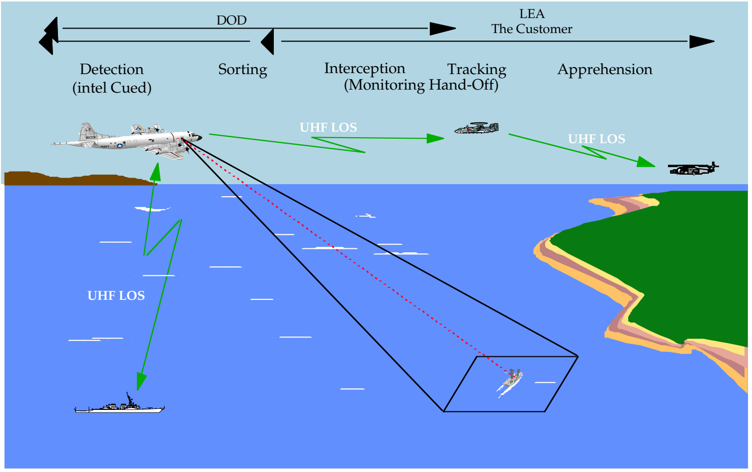
OBJECTIVES:

- DETECT, TRACK, AND IDENTIFY FRIENDLY, FOE, AND NEUTRAL TARGETS AT EXTENDED RANGES WITH A LOW PROBABILITY OF INTERCEPT (LPI)
- REDUCE FRATRICIDE/IMPROVE EARLY WARNING TARGETING
- DEMONSTRATE NEAR REAL TIME TACTICAL DISSEMINATION OF TARGET TRACK DATA AND SURVEILLANCE IMAGERY

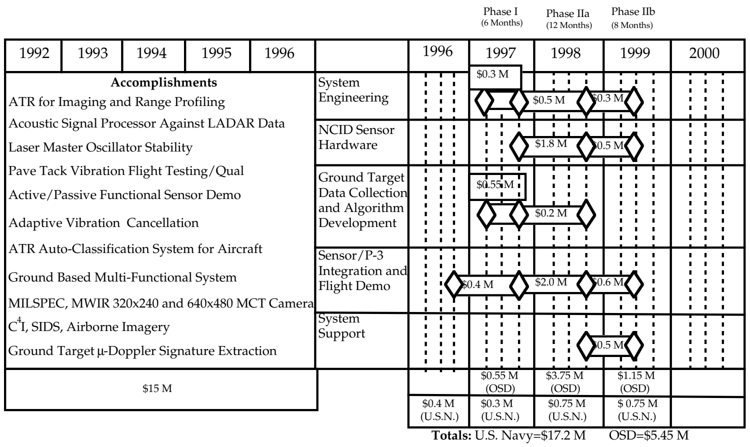
PHASE I: THE NAVY RADIANT OUTLAW ATD INCLUDED SHIP AND AIRCRAFT SIGNATURE DATA COLLECTION AND THE INITIATION OF A TARGET CLASSIFICATION LIBRARY. ADDITIONAL TARGET DATA WILL BE COLLECTED AND ALGORITHMS FOR BOTH SEA AND AIR TARGETS WILL BE COMPLETED.

PHASE II: INCLUDES TWO SUB-PHASES.

- <u>PHASE IIa</u>: INSTALL AND DEMONSTRATE ABOARD A USN P-3C THE SYSTEM'S 3RD GENERATION, 640X480 FPA, STARING, MID-WAVE, INFRARED CAMERA FOR INCREASED RANGE PASSIVE DETECTION.
- <u>PHASE IIb</u>: INSTALL THE SYSTEM'S LASER RADAR AND DEMONSTRATE ITS ABILITY TO PERFORM LPI TARGET TRACKING AND CLASSIFICATION FOR INCREASED RESPONSE TIME BY AIR OR SURFACE INTERDICTION ASSETS.



FUNDING ($M):



APPROACH:

FY96: DEVELOP ATR DATABASE AND BEGIN PREPARATIONS FOR RADIANT OUTLAW II RD GEN FLIR INSTALLATION ABOARD P-3C WITH C4I PACKAGE FOR DEPLOYMENT TO JIATFE AOR.

FY97: INSTALL AND DEPLOY RADIANT OUTLAW II FLIR TO ASSIST WITH COUNTERDRUG (CD) OPERATIONS IN THE CARIBBEAN, FLORIDA STRAITS, AND GULF OF MEXICO.

- PROVIDE QUANTUM IMPROVEMENT IN NIGHTTIME INFRARED SEARCH AND MARITIME INTERDICTION OPERATIONS.

FY98-99: INSTALL AND DEPLOY RADIANT OUTLAW II LADAR.

- SEARCH LARGER AREAS IN LESS TIME.
- INCREASE RESPONSE TIME OF JIATFE PATROL ASSETS BY MORE EFFICIENTLY SORTING AND IDENTIFYING NUMEROUS TARGETS.
- IMPROVE INTELLIGENCE COLLECTION CAPABILITY.

APPLICATION:

- EARLY AND EFFICIENT TARGET SORT AND PRECISION TARGETING IDENTIFICATION APPLICABLE TO ALL THEATER PLATFORMS TO REDUCE FRATRICIDE AND INCREASE SURVEILLANCE AND TACTICAL MISSION EFFECTIVENESS.

PRECISION TARGETING IDENTIFICATION (PTI) PROPOSED ACTD DECISION CRITERIA

OPERATIONAL CAPABILITY	BASELINE	ACTD MINIMUM	IMPROVEMENT	EMD
SURVEILLANCE AND NON-COOPERATIVE TARGET IDENTIFICATION (NCID) • Equipment • Range	1st Gen LWIR FLIR 5-20 km weather ltd	3rd Gen MWIR FLIR 20-40 km weather ltd	MWIR FLIR + LADAR 50-75 km weather ltd	MWIR, LADAR, POD 70-125 km weather ltd
PRECISION TARGETING • Equipment • Range • Accuracy	Laser Designator 12-15 km ~100 meters	Laser Designator 20 km ~15 meters	LADAR + Designator 20-50 km ~15 meters	LADAR + Designator 50+ km ≤15 meters
JOINT INTEROPERABILITY • Equipment	**C4I** LINK 11, VOICE & KEYLISTS	**C4I** TIBS, LINK 16, OTCIXS, LINK 11, VOICE + KEYLISTS	**C4I** TIBS, LINK 16, OTCIXS, LINK 11, VOICE + KEYLISTS, GPS	**C4I** TIBS, LINK 16, OTCIXS, LINK 11, VOICE + KEYLISTS, GPS
AUTOMATIC TARGET RECOGNITION (ATR)	None	NCID of: –Aircraft –Ships	NCID of: –Aircraft –Ships –Ground Combat Vehicles	NCID of: –Aircraft –Ships –Ground Combat Vehicles
SEARCH AREA IMPROVEMENT (over current P3 operations)			200%	

D. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION
AND ADVANCED TECHNOLOGY DEMONSTRATION
PROGRAM SUMMARIES
FOR JOINT THEATER MISSILE DEFENSE

D. JOINT THEATER MISSILE DEFENSE

CRUISE MISSILE DEFENSE (CMD) PHASE II ACTD (PROPOSED)

OBJECTIVES:

- FOLLOW-ON TO PHASE I WITH
  - FIXED WING AND AEROSTAT SENSORS
  - RAPID DATA DISSEMINATION TO SHOOTERS
  - PATRIOT AND AEGIS ADSAM CAPABILITY
  - FIGHTERS/AMRAAM
  - IMPROVED, CENTRALIZED TARGET ID
  - REQUIRED WPN SYSTEM MODIFICATIONS
  - JOINT CONOPS
- PREPARE FOR ACQUISITION DECISION ON
  - AIRBORNE SENSORS
  - MODIFIED WEAPON SYSTEMS AND MISSILES

NOT AVAILABLE

SCHEDULE:

- FY96 START
- DEMOs IN FY98-01

STATUS:

- EXISTING TECHNOLOGY DEMO PROGRAM (KNOWN AS 2+2) DIRECTED BY DEPSECDEF IN DEC 94

FUNDING ($M):

	FY97	FY87	FY99	FY00	FY01
TO BE DETERMINED					

PLAYERS:

- S&T: ARMY MICOM, PEO-MD, NAVY PEO-TAD, AF PEO, ESC, ARPA, BMDO
- USERS: TBD

TECHNOLOGY:

- EXISTING ADVANCED SURVEILLANCE AND FIRE CONTROL SENSORS
- MINOR MODS TO EXISTING WEAPONS SYSTEMS AND MISSILES
- CEC/JTIDS FOR DATA DISSEMINATION

CRUISE MISSILE DEFENSE (CMD) PHASE II ACTD (PROPOSED) EXIT CRITERIA		
OPERATIONAL CAPABILITY	**CURRENT CAPABILITY**	**END GOALS**
	NOT AVAILABLE	

AEROSTATS FOR CRUISE MISSILE DEFENSE ACTD (PROPOSED)

OBJECTIVES:

- DEMONSTRATE
  - AEROSTAT AIRWORTHINESS, AVAILABILITY, DEPLOYABILITY, MANEUVERABILITY
  - ADVANCED SURVEILLANCE AND FIRE CONTROL SENSORS
  - DATA DISSEMINATION TO AEGIS, PATRIOT, AND FIGHTERS
- DEVELOP AND EVALUATE
  - CONOPS
  - DATA DISSEMINATION CONCEPTS SUPPORTING TAD AND TMD

NOT AVAILABLE

SCHEDULE:

- FY96 START
- 3-4 OPERATIONAL SYSTEMS IN 2001

STATUS:

- JPO BEING FORMED WITH ARMY LEAD
- PROGRAM DETAILS BEING DEFINED

FUNDING ($M):

	FY97	FY87	FY99	FY00	FY01
	40.0	110.0	140.0	115.0	120.0

*FUNDS IDENTIFIED IN PBD 725.

PLAYERS:

- ARMY SSDC, NAVY PEO TAD, AF PEO, ARPA, BMDO
- USERS TBD

TECHNOLOGY:

- AEROSTAT DERIVATIVE OF EXISTING DESIGNS (NOMINALLY 91M VS. EXISTING 71M)
- SENSORS ARE LIGHTWEIGHT DERIVATIVES OF EXISTING SYSTEMS

AEROSTATS FOR CRUISE MISSILE DEFENSE ACTD (PROPOSED) EXIT CRITERIA		
OPERATIONAL CAPABILITY	**CURRENT CAPABILITY**	**END GOALS**
	NOT AVAILABLE	

E. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION
AND ADVANCED TECHNOLOGY DEMONSTRATION
PROGRAM SUMMARIES
FOR MILITARY OPERATIONS IN URBAN TERRAIN

E. MILITARY OPERATIONS IN URBAN TERRAIN

OBJECTIVE INDIVIDUAL COMBAT WEAPON (OICW) ATD

OBJECTIVE:

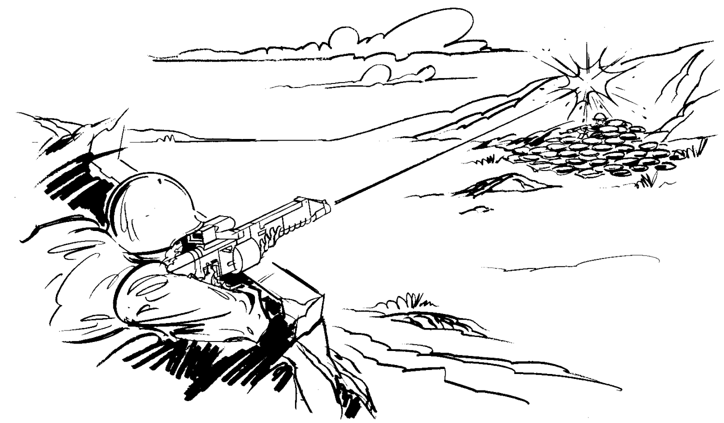
DEMONSTRATE OICW OPERATIONAL UTILITY, VERSATILITY, TECHNOLOGICAL MATURITY AND LETHALITY THROUGH SCENARIO DRIVEN TROOP TESTING, SIMULATION, AND 21ST CENTURY LAND WARRIOR (21 CLW)/GENERATION II (GEN II) SOLDIER SYSTEM INTERFACING.

JUSTIFICATION:

- IMPROVED HIT PROBABILITY: >0.5 TO 500m (300+% IMPROVEMENT
- DECISIVELY VIOLENT AND SUPPRESSIVE TARGET EFFECTS
- INCREASED EFFECTIVE RANGE
- ABILITY TO DEFEAT DEFILADE TARGETS
- ARMY & JOINT SERVICE SMALL ARMS MASTER PLANS, PLUS THE OICW MISSION NEED STATEMENT, DEFINE THE NEED FOR A SINGLE REPLACEMENT FOR THE M16A2 RIFLE, M203 GRENADE LAUNCHER, AND SELECTED M249 SQUAD AUTOMATIC WEAPONS.

PM: PM-Small Arms ***Battle Lab:*** DBBL, EELSBL

Objective Individual Combat Weapon (OICW)



SCHEDULE AND FUNDING:

MILESTONES	FY94	FY95	FY96	FY97	FY98	FY99
TRANSITION TO 6.3	▲					
TRADE-OFF DETERMINATION	▬					
INDUSTRY SOLICITATION	▬					
CONTRACT AWARD	▲					
CONCEPT DESIGN	▬					
PROTOTYPE DEVELOPMENT & BUILD		▬	▬	▬		
PROTOTYPE DEMONSTRATION				▲		
OICW ATD					▬	
PREPARE FOR MILESTONE DECISION						▬
TRANSITION TO 6.5						▲
21 CLW TLD/GEN II ATD	▬	▬	▬	▬	▬	
FUNDING: TOTAL $K	1895	4378	3827	995	3352	3010

APPROACH:

- TECHNOLOGY/SYSTEM PERFORMANCE TRADE-OFFS
- CASTFOREM SIMULATION
- MAN-IN-THE-LOOP SIMULATION: FEEDS DISTRIBUTED INTERACTIVE SIMULATION (DIS)
- LEVERAGE 21CLW TECHNOLOGY PROGRAMS
- DESIGN AND DEMONSTRATE INTEGRATED OICW SYSTEMS:
  - AIR BURSTING WARHEADS/MORE POWERFUL EXPLOSIVES
  - MODULAR OPTOELECTRONIC FIRE CONTROL
  - COMPOSITE WEAPON COMPONENTS
  - DYNAMIC DAMPING TECHNIQUES
- BUILD SYSTEMS FOR SCENARIO DRIVEN OPERATIONAL TESTS
- PROVIDE SYSTEMS FOR INTEGRATION INTO 21CLW TLD
- DEMONSTRATE OPERATIONAL UTILITY

APPLICATIONS:

- OBJECTIVE FAMILY OF SMALL ARMS (OFSA)
- LINKS TO 21CLW/GEN II HELMET AND COMPUTER

OBJECTIVE INDIVIDUAL COMBAT WEAPON (OICW) ATD EXIT CRITERIA					
	CURRENT BASELINE		**OICW ATD**		**FUE**
EXIT CRITERIA METRIC	**Hardware**	**Capability**	**Threshold**	**Goal**	**Goal**
Probability of Incapacitation [P(i)] • Point Target (visible) • Defilade Target (concealed)	M16A2/M203 (M855/M433)	< 5% 0%	≥50% @ 300m ≥20% @ 300m	≥90% @ 500m ≥50% @ 500m	
Transmit Time-of-Flight Signal to Air-Bursting Munition • Mechanical/Inductive Transmission	M16A2/M203 (M855/M433)	No capability	Single shot	Semi-automatic	
Probability of Suppression [P(s)] • Area Target @ 750m • Area Target @ 1,000m	M16A2/M203 (M855/M433)	Minimal Minimal	Suppress enemy squad Suppress enemy squad	Suppress for 180 sec Suppress enemy squad	
Firepower (Quantity) • Loaded Weapon	M16A2/M203	• 30 KE • 1 HE	≥20 KE ≥ 6 HE	≥30 KE ≥10 HE	
Weight (lbs) • Empty Weapon and Basic Modular Electronic Fire Control –Loaded • Empty Weapon and Modular Electronic Fire Control w/Thermal Module –Loaded	M16A2/M203 (AN/PVS-4) M16A2/M203/ (LTWS)	10.7 14.2 15.71 15.05 16.56	15 18 16 19	10 12 15 17	10 12 13 15
Compatibility With Future Individual Soldier Systems	GEN II Soldier		Linkage to GEN II helmet & computer	Linkage to GEN II helmet & computer w/no performance degradation	
Cost Projections ($) • Weapon and Basic Electronic Fire Control System • Weapon and Modular Electronic Fire Control w/Thermal Module • High Explosive, Air-Bursting Munition	M16A2/M203 (AN/PVS-4) M16A2/M203/ (LTWS) 40mm M433 (Point Detonating)	$650 $4,650 $20,000 + $14.00	$10,000 $15,000 $30 (Air Bursting)	$7,000 $12,000 $25 (Air Bursting)	$5,000 $10,000 $19–$15

ADVANCED IMAGE INTENSIFICATION (AI^2) ATD

OBJECTIVE:
- DEMONSTRATE NEXT GENERATION NIGHT VISION GOGGLES WHICH IMPROVE OPERATIONAL EFFECTIVENESS AND REDUCE WORKLOAD FOR DISMOUNTED, AVIATION AND CS/CSS APPLICATIONS

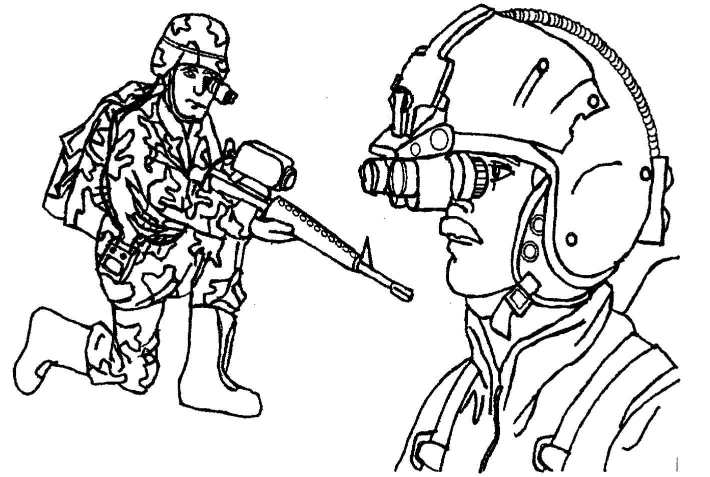
JUSTIFICATION:
- ADVANCED I2 PROVIDES SIGNIFICANTLY ENHANCED OPERATIONAL EFFECTIVENESS BY IMPROVING THE MOBILITY AND VERSATILITY OF THE DISMOUNTED SOLDIER, CARGO, UTILITY, AND AIRCRAFT, AS WELL AS THE COMBAT SERVICE SUPPORT SOLDIER
- IMPROVING THE ARMY'S CAPABILITY TO FLY AND FIGHT AT NIGHT REMAINS A TOP USER PRIORITY

BATTLELAB:
- DISMOUNTED BATTLESPACE (LEAD)
- COMBAT SERVICE SUPPORT (SPT)
- AVIATION CENTER (SPT)

PEO:
- IEW (PM NV/RSTA)
- PM SOLDIER

SCHEDULE AND FUNDING:

MILESTONE	FY93	FY94	FY95	FY96
I2 Technology				
Optics Material & Design				
Human Factors				
Enhanced Integrated Display				
ATD Demonstrators				
AWE's/User Tests	▲	▲ ▲	Δ	Δ
Ai^2 Component Technology Feeds		▲	Δ	Δ



APPROACH:
- INCORPORATE "LESSONS LEARNED" FROM FIELD EXPERIENCE
- EXPLOIT RECENT TECHNOLOGY ADVANCED TO:
  - INCREASE VISUAL ACUITY BY 50% IN LOW LIGHT
  - INCREASE FOV (DOUBLE AREA OF COVERAGE)
  - INTEGRATE DISPLAY OF FLIGHT SYMBOLOGY, THERMAL WEAPONS SIGHT (TWS) AND COMPUTER GRAPHICS
  - IMPROVE HUMAN FACTORS
- INCORPORATE IPPD APPROACH TO ADDRESS PRODUCIBILITY AND AFFORDABILITY RISKS AND USE STATISTICAL METRICS TO ESTIMATE AND MANAGE ATD SIGMA

APPLICATIONS:
- 21 CLW TLD
- DISMOUNTED SOLDIER (LAND WARRIOR)
- AVIATION (SOF, CARGO, UTILITY, AND CURRENT SCOUT)
- COMBAT SUPPORT/COMBAT SERVICE SUPPORT (CS/CSS)

ADVANCED IMAGE INTENSIFICATION (AI²) ATD EXIT CRITERIA

OPERATIONAL CAPABILITY	CURRENT CAPABILITY	END ATD	
		MINIMUM	GOAL
FIELD OF VIEW (FOV)	40°	60°	60°
EYE RELIEF (mm)	15	20	25
NBC MASK COMPATIBILITY	<40° FOV	50° FOV	60° FOV
OVERCAST STARLIGHT RESOLUTION (CY/MRAD)	0.3	0.4	0.5
HIGH LIGHT RESOLUTION (CY/MRAD)	0.8	0.8	1.1
INTEGRATED DISPLAY			
GROUND	No	RS-170/VGA	RS-170/VGA
AIR	AN/AVS-7	RS-170/VGA	RS-170/VGA

FORWARD OBSERVER/FORWARD AIR CONTROLLER (FO/FAC)

NEED/PAYOFF:

- **CURRENT EQUIPMENT HAS SIGNIFICANT DEFICIENCIES:**
  - **ACCURATE LOCATION OF TARGETS**
  - **RAPID CALL FOR FIRE/ADJUSTMENT**
  - **USER INTERFACES**
  - **PORTABILITY**
  - **AUTOMATED TARGET HANDOFF**
- **SYSTEM WILL PROVIDE ENHANCED CAPABILITIES TO:**
  - **QUICKLY AND ACCURATELY LOCATE AND IDENTIFY GROUND TARGETS FOR ATTACK BY INDIRECT FIRE WEAPONS AND CLOSE-AIR SUPPORT (CAS)**
  - **RAPIDLY TRANSMIT TARGETING DATA TO FIRE SUPPORT ELEMENTS (PRE-FORMATTED, BURST TRANSMITTED)**
  - **QUICKLY AND ACCURATELY ADJUST FIRE**
- **FO/FAC SYSTEM CAPABILITIES WILL PAY OFF IN SIGNIFICANTLY MORE EFFECTIVE AND SURVIVABLE FIRE SUPPORT AND CAS AND REDUCED FO/FAC COMBAT LOAD**

SCHEDULE AND FUNDING:

MILESTONES	FY94	FY95	FY96	FY97	FY98	FY99	FY00	FY01
6.3								
MS I								
6.4								
MS II								
6.5								
MS III								

PROSPECTIVE PM – GND WPNS/C4I
IOC - FY02
USMC PROGRAM

TECHNOLOGY APPROACH:

- **DEVELOP STRUCTURED/FLEXIBLE SYSTEM ARCHITECTURE.**
- **GPS / AZ / MELIOS / DCT / SINCGARS / INTERFACED WITH FSCC / DASC / ATHS.**
- **DEVELOP LIGHTWEIGHT, EASILY MANPORTABLE, INTEGRATED, USER FRIENDLY SYSTEM FULFILLING FO/FAC MISSION REQUIREMENTS.**
- **PROVIDE FULL COMPATIBILITY/INTEROPERABILITY WITH SUPPORTING ARMS ELEMENTS.**
- **IDENTIFY/EVALUATE MILITARY WORTH AND SYSTEM IMPLICATIONS OF FO/FAC SYSTEM DESIGN OPTIONS.**
- **TEST/DEMONSTRATE/EVALUATE CONCEPT DEMONSTRATION FO/FAC SYSTEMS UNDER REPRESENTING OPERATIONAL CONDITIONS (DT-0/OT-0).**

PERFORMING ACTIVITIES:

- **NSWCDD, DAHLGREN, VA**
- **ROCKWELL**

FORWARD OBSERVER/FORWARD AIR CONTROLLER (FO/FAC)

THE EXIT CRITERIA FOR TRANSITION OF THE FO/FAC ATD PROGRAM TO 6.4 WILL BE THE DEMONSTRATED ABILITY OF THE FO/FAC ATD SYSTEMS TO PROVIDE THE FOLLOWING:

√ 1. AN AUTOMATED CAPABILITY FOR DETERMINING OBSERVER LOCATION

√ 2. A FUNCTIONALLY INTEGRATED DAY/NIGHT VISION CAPABILITY

√ 3. AN AUTOMATED CAPABILITY FOR DETERMINING TARGET LOCATION

√ 4. AN INTEGRATED, COMPUTER-AIDED COMMUNICATIONS CAPABILITY TO TRANSMIT, RECEIVE, AND EDIT MARINE TACTICAL SYSTEM (MTS) MESSAGES

5. THE ABILITY TO INTERFACE AND INTEROPERATE WITH A LASER DESIGNATOR (FEBRUARY TEST PLANNED)

√ 6. THE ABILITY TO INTEROPERATE WITH AUTOMATIC TARGET HANDOFF SYSTEM (ATHS) EQUIPPED AIRCRAFT

√ 7. AN ENHANCED CAPABILITY TO ADJUST FIRE, AND

√ 8. AN ENHANCED CAPABILITY TO ENGAGE MOVING TARGETS.

FROM ADVANCED TECHNOLOGY DEMONSTRATION/ADVANCED DEVELOPMENT MASTER PLAN, FY94 (DATED 1 MAY 1994)

√ = COMPLETED CRITERIA

MILITARY OPERATIONS IN URBAN TERRAIN (MOUT) ACTD (PROPOSED)

OBJECTIVE:

JUSTIFICATION:

PM: ***Battle Lab:***

CANDIDATE ACTD—NOT DEFINED OR APPROVED

SCHEDULE AND FUNDING:

MILESTONES	FY94	FY95	FY96	FY97	FY98	FY99

APPROACH:

APPLICATIONS:

NOTE: MOUT ACTD STILL NOT APPROVED WITH OSD. QUAD CHART CAN BE ADDED IN NEXT CYCLE, AFTER APPROVAL.

MILITARY OPERATIONS IN URBAN TERRAIN ACTD EXIT CRITERIA

PROPOSED ACTD—NOT YET DEFINED

F. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION AND ADVANCED TECHNOLOGY DEMONSTRATION PROGRAM SUMMARIES FOR JOINT READINESS

F. JOINT READINESS

SYNTHETIC THEATER OF WAR (STOW) ACTD

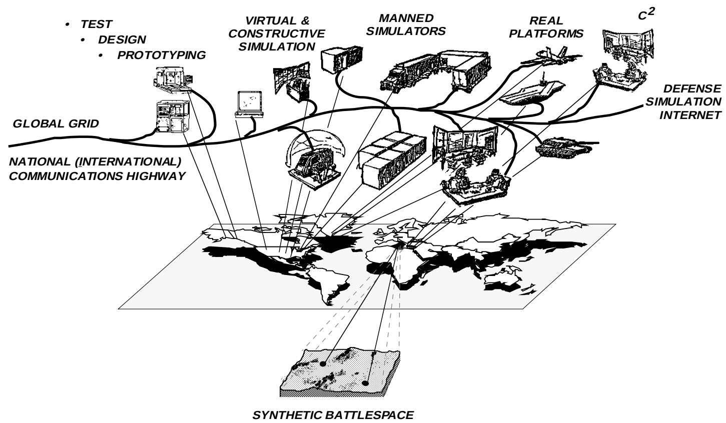
OBJECTIVE:

IMPROVE THE CONDUCT OF JOINT TRAINING AND PROVIDE SIMULATION-DRIVEN MISSION REHEARSAL CAPABILITY TO CINC USACOM.

- IMPROVE QUALITY OF SIMULATIONS BY DEVELOPING REPRESENTATIONS OF COMBAT ACTIONS RESOLVED AT THE ENTITY LEVEL, COMMAND AND CONTROL BEHAVIORS, AND HIGH-RESOLUTION DYNAMIC ENVIRONMENTS THAT INCLUDE TACTICALLY SIGNIFICANT ENVIRONMENTAL EFFECTS.
- IMPROVE SIMULATION TRAINING EFFECTIVENESS AND FLEXIBILITY BY INTERFACING SIMULATIONS WITH OPERATIONAL C4I SYSTEMS AND BY DEVELOPING KNOWLEDGE-BASED SEMI-AUTONOMOUS FORCES, FASTER DATABASE BUILDS, AND IMPROVED INFORMATION TRANSFER AMONG DISTRIBUTED PARTICIPANTS.
- IMPROVE AFTER-ACTION ANALYTIC TOOLS AND DEVELOP EFFECTIVE METHODS FOR EXERCISING GENERATION AND CONTROL.
- TRANSITION ADVANCED TECHNOLOGIES TO JOINT AND SERVICE SIMULATIONS (E.G., JSIMS AND WARSIMS)

JUSTIFICATION:

THE JOINT COMMUNITY REQUIRES HIGHER QUALITY SIMULATIONS THAT SUPPORT MORE EFFICIENT AND EFFECTIVE JOINT TRAINING, BETTER MISSION REHEARSAL CAPABILITIES, BETTER ASSESSMENT CAPABILITIES, AND LOWER OVERHEAD COST FOR TRAINING EXERCISES.



SCHEDULE AND FUNDING:

SCHEDULE	FY95	FY96	FY97	FY98	FY99
TECHNOLOGY DEVELOPMENT					
TECHNOLOGY INTEGRATION					
OPERATIONAL SIMULATION TECHNOLOGY					
TECHNOLOGY, INTEGRATION, AND DEMONSTRATIONS	STOW Europe	ED1	ED2	ACTD	
FUNDING					
PROJECT EE37		57.6	48.4	42.3	44.7
PROJECT EE46		26.9	39.7	3.0	0.0
TOTAL		84.5	88.1	45.3	44.7

APPROACH:

- DEMONSTRATE INTEGRATION OF LIVE, VIRTUAL, AND CONSTRUCTIVE SIMULATIONS IN A GLOBAL DISTRIBUTED NETWORK SUPPORTING TRAINING AT THE BRIGADE LEVEL DURING THE JOINT EXERCISE ATLANTIC RESOLVE 94 (STOW-EUROPE).
- DEVELOP STOW CAPABILITY IN THREE TECHNOLOGY AREAS: REAL-TIME INFORMATION TRANSFER, SYNTHETIC FORCES, AND NETWORKING OF SYNTHETIC FORCES.
- USE STOW INTEGRATION EFFORT AS PROTOTYPE FOR DoD SIMULATION HIGH LEVEL ARCHITECTURE.
- DEVELOP OPERATIONAL SIMULATION TECHNOLOGIES THAT IMPROVE THE EFFICIENCY OF EXERCISE PLANNING, REHEARSING, AND EXECUTING LIVE OPERATIONS.
- CONDUCT ACTD IN SUPPORT OF THE USACOM DIRECTED JOINT EXERCISE, UNIFIED ENDEAVOR 98-1.

SYNTHETIC THEATER OF WAR (STOW) EXIT CRITERIA

TECHNOLOGY	CURRENT CAPABILITY	MINIMUM EXIT CRITERIA	GOAL EXIT CRITERIA
SYNTHETIC FORCES • Platform level OpenSAF models • Command Forces (CFOR) • Command and Control Simulation Interface Language (CCSIL)	• Enough ModSAF models to populate a limited Combined Task Force and OPFOR. • CFOR software and data to simulate command entities at the company level.	• Enough OpenSAF models to populate STOW 97 Combined Task Force and OPFOR. • CFOR software and data to simulate command entities required above. • Explicit CCSIL modeling of messages in USMTF format.	• Enough OpenSAF models to populate MRC and OPFOR. • CFOR software and data to simulate command entities required above. • Explicit CCSIL modeling of messages in USMTF format.
SYNTHETIC ENVIRONMENTS • Independent environmental phenomena • Dynamic terrain • Weather effects • Environmental and phenomenological effects • Improved database standards • Multi-resolution databases	• Selected phenomena such as battlefield smoke, signal flares, time-of-day, dust clouds, weapons effects, and trafficability. • Limited dynamic terrain (buildings and bridges). • Environmental interaction with ModSAF • Multi-resolution databases (400 x 400 km).	• Selected phenomena such as battlefield smoke, signal flares, vehicle dust, clouds, thunderstorms, time-of-day, dust clouds and storms, weapons effects, and trafficability. • Limited dynamic terrain. • Integration of localized weather. • OpenSAF environmental interaction. • Improved database standards that support correlation. • Multi-resolution databases (500 x 700 km).	• Selected phenomena will include oceanographic (surface and sub-surface) and aerospace effects.
NETWORKS • High speed networks • Security design • Network management tools	• Economical, high bandwidth (5000 entities) and reliable service for STOW 97 events. • Implemented on DSI. • Some manual network management tools.	• Economical, high bandwidth (10,000 entities) and reliable service for STOW 97 events. • Implement NSA's FASTLANE. • Manual tools for network management and troubleshooting.	• Economical, high bandwidth (50,000 entities) and reliable service for STOW 97 events.
SYSTEM INTEGRATION • High Level Architecture (HLA) • Support tools • C4I and other interfaces	• Currently not integrated. • No support tools. • Integration of live, virtual, and constructive simulations demonstrated at the Brigade level during STOW-Europe.	• HLA Compliance. • Prototype suite of tools for exercise generation, automated data collection, exercise management, and after-action review. • Interfaces for 2-4 systems under DMSO's Modular Reconfigurable C4I Interface (MRCI).	• Same as minimum criteria.

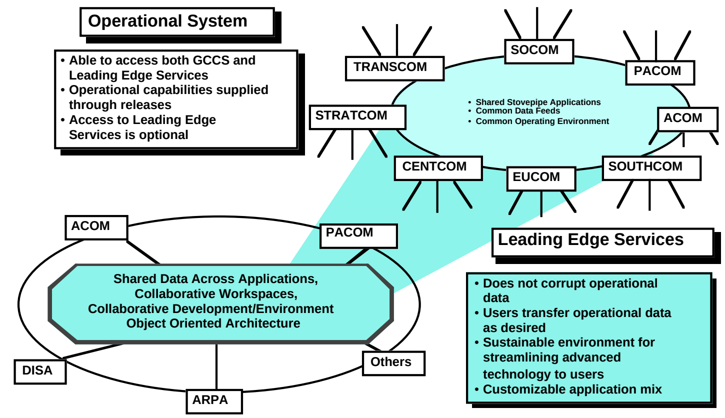
ADVANCED JOINT PLANNING ACTD

OBJECTIVE:

- DEMONSTRATE, HARDEN, AND LEAVE IN PLACE ENHANCED C4I TECHNOLOGIES WHICH GREATLY ENHANCE THE CINC's ABILITY TO CONDUCT OPERATIONS.
  - ENHANCE CINC's READINESS ASSESSMENT, CAMPAIGN PLANNING, AND REHEARSAL CAPABILITIES
    – REDUCE PLANNING CYCLES FROM WEEKS TO DAY/HOURS
    – MORE EFFECTIVE AND EFFICIENT
  - TRANSITION SUPPORTABLE SYSTEMS THROUGH DISA LES OR APPROPRIATE SERVICE SUPPORT AGENTS.

JUSTIFICATION:

- RAPID TURNAROUND OF TECHNOLOGICAL SOLUTIONS TO MEET THE USER'S IMMEDIATE ADVANCED JOINT PLANNING NEEDS CAN AFFORD THOSE USERS A POWERFUL AND FULLY TAILORED SYSTEM NOT AVAILABLE OTHERWISE. FULL USER PARTICIPATION IN CONOPS DEFINITION AND TAILORING AND REFINEMENT OF EMERGING TOOLS ENSURES OWNERSHIP OF THESE SOLUTIONS.



SCHEDULE AND FUNDING ($M):

MILESTONES	FY95	FY96	FY97	FY98
FORCE READINESS	▬	▬	▬	
FORCE PLANNING		▬	▬	
FORCE REHEARSAL			▬	
TRANSITION				▬
PE 63226E TOTAL	4.9	12.9	9.0	1.3

APPROACH:

- EVOLVE USER'S OPERATIONAL C4I PROCESSES THROUGH RAPID "PLUG IN" OF ADVANCED TECHNOLOGY FROM OTHER ARPA PROGRAMS.
- FOCUS ON THE AREAS OF FORCE READINESS, CAMPAIGN, OPERATIONAL AND DEPLOYMENT PLANNING, LOGISTICS PLANNING, AND REHEARSAL.
- MAXIMIZE USER INVOLVEMENT IN SOFTWARE REFINEMENT AND CONOPS DEVELOPMENT.
- EXECUTE PROGRAM THROUGH USER'S ENVIRONMENT (USACOM).
- TRANSITION CAPABILITIES TO GCCS VIA ARPA-DISA JPO's LEADING EDGE SERVICES.

ADVANCED JOINT PLANNING ACTD EXIT CRITERIA

TECHNOLOGY	CURRENT CAPABILITY	MINIMUM EXIT CRITERIA	GOAL EXIT CRITERIA
FORCE READINESS EVALUATION	• Force readiness calculated manually using limited readiness database and multiple non-automated tools. Process takes in excess of one week.	• Automation of manual processes to expedite calculations. Includes access to a greater number of readiness databases. Process measured in days.	• Fully automatic real time calculation of force readiness at all command levels with seamless access to respective readiness databases. Process measured in hours.
LOGISTICS PLANNING	• Manual TPFDD generation and modification. Process measured in weeks.	• Logistics and transportation feasibility using automated TPFDD generation tools. Process measured in days.	• Fully automated no-plan TPFDD generation including feasibility, "what-if" evaluations, and fiscal measurement. Process measured in hours.
CAMPAIGN, OPERATIONAL, AND DEPLOYMENT PLANNING	• Plans generated and modified manually. Minimal number of Courses of Action (COA) planned. Long plan generation time.	• Automated interoperable plan generation including readiness, logistics, and air operations. Limited numbers of COAs can be developed for evaluation over several day periods.	• Fully integrated automatic plan generation allowing multiple COA development and "what-if"' scenario generation. Support for rehearsal and evaluation. Process measured in hours.
USER INVOLVEMENT IN SOFTWARE TOOL REFINEMENT AND CONOPS DEVELOPMENT	• Software developed using dated operational requirements and specifications without course correction to support involvement measured in multiple years.	• User provides feedback for refinement of tools developed in JTF ATD and other programs. CONOPS considerations included in process. Requirements updates introduced periodically.	• Full user involvement in the software refinement and between software releases measured in months achievable.

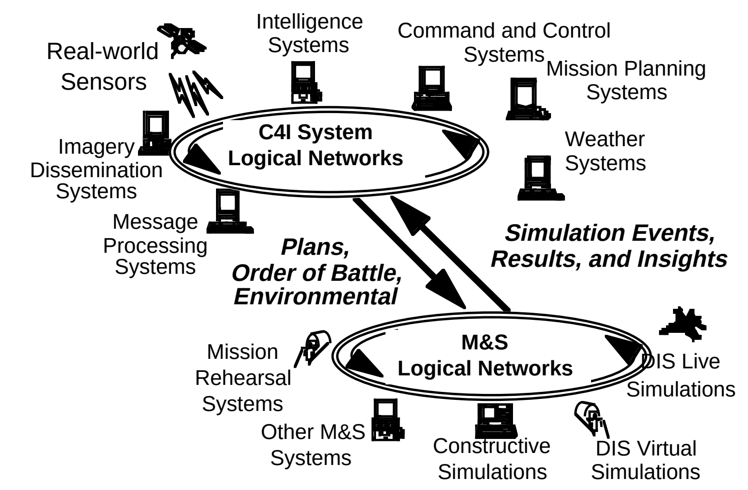
ADVANCED DISTRIBUTED SIMULATION

OBJECTIVE:

DEVELOP ADVANCED, INTEROPERABLE M&S TOOLS, SYNTHETIC ENVIRONMENTS, AND C4I-SIMULATION INTERFACES THAT OFFER MORE EFFECTIVE AND LESS RESOURCE INTENSIVE MEANS OF ENHANCING JOINT, COMBINED, AND INTEROPERABILITY TRAINING; MISSION PLANNING AND REHEARSAL; AND ASSESSMENT AND STATUS REPORTING.

JUSTIFICATION:

DISTRIBUTED INTERACTIVE SYNTHETIC ENVIRONMENTS BRIDGE LARGE GEOGRAPHIC REGIONS AND INVOLVE ENTIRE JOINT FORCES. WARFIGHTERS MAY TRAIN OR REHEARSE MISSIONS JOINTLY WITH CREDIBLE SIMULATIONS OF FRIENDLY FORCES, ANTICIPATED TERRAIN, ENVIRONMENTAL CONDITIONS, AND THREATS.



SCHEDULE AND FUNDING:

MILESTONE	FY97	FY98	FY99	FY00
•Technical Framework — HLA	HLA Proto-Federation	HLA Baseline Test & Transition		
— CMMS		CMMS Updates		
— DATA standardization	Data Model Stds & Complex Data Modeling			Data Security & Data Optimization
•Authoritative Representations — Environment (terrain, oceans, atmosphere, space)	Service/Agency System Reps		Advanced System Reps	
— Systems	Service/Agency System Reps	Advanced System Reps		
— Individual and Group Behavior		Dev of Human/Group Representations		
•C4I-Simulation Interfaces	MRCI 1.0	Dev, Integ, Test, & Standardization		
Funding ($M)	**78.2**	**88.8**	**88.1**	**85.2**

APPROACH:

- **TO SUPPORT INTEROPERABILITY OF SIMULATIONS, DEVELOP A TECHNICAL FRAMEWORK, INCLUDING A HIGH LEVEL ARCHITECTURE (HLA), CONCEPTUAL MODELS OF THE MISSION SPACE (CMMS), AND DATA STANDARDIZATION.**
- **DEVELOP AUTHORITATIVE REPRESENTATIONS OF THE ENVIRONMENT; LEAD FOR EACH ENVIRONMENT ELEMENT: DMA (TERRAIN), NAVY (OCEANS), AND AIR FORCE (ATMOSPHERE AND SPACE).**
- **DEVELOP AUTHORITATIVE REPRESENTATIONS OF SYSTEMS—RESPONSIBILITY OF INDIVIDUAL SERVICES.**
- **DEVELOP AUTHORITATIVE REPRESENTATIONS OF INDIVIDUAL AND GROUP C2 BEHAVIOR.**
- **DEVELOP COST EFFECTIVE, "SEAMLESS" INTERFACES BETWEEN C4I SYSTEMS AND SIMULATIONS—MODULAR RECONFIGURABLE C4I INTERFACE (MRCI).**

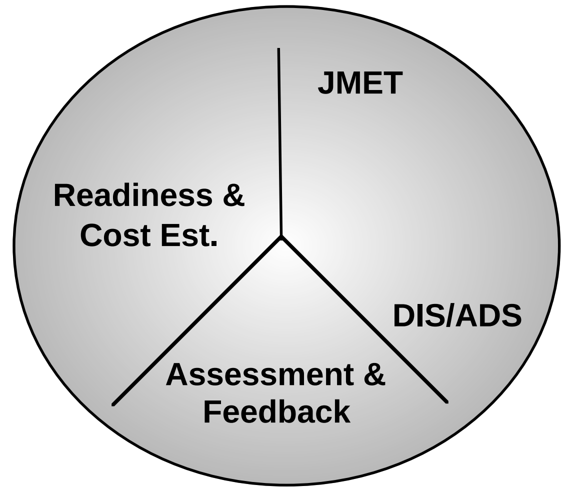
ADVANCED DISTRIBUTED SIMULATION EXIT CRITERIA

OPERATIONAL CAPABILITY	**BASELINE**	**MINIMUM**	**GOAL**
JOINT, COMBINED, AND INTEROPERABILITY TRAINING	MUST BRING JOINT OR COMBINED FORCES PHYSICALLY TOGETHER AT A SINGLE LOCATION TO USE DEDICATED M&S APPLICATIONS OR CONDUCT LIVE EXERCISES.	DISTRIBUTED M&S TRAINING APPLICATIONS WITH SOME LINKAGE TO THE WARFIGHTER THROUGH REAL-WORLD C4I SYSTEMS. TRAINING MAY BE LIMITED TO ECHELON LEVEL.	FULLY DISTRIBUTED M&S TRAINING APPLICATIONS WITH SEAMLESS LINKAGE TO WARFIGHTER THROUGH REAL-WORLD C4I SYSTEMS, AT ALL LEVELS OF THE JOINT FORCE.
MISSION PLANNING AND REHEARSAL	TIME CONSUMING AND MANUALLY INTENSIVE PLANNING. LIMITED INTEROPERABILITY AMONG C2 SYSTEMS. LIMITED BATTLEFIELD VISUALIZATION. FEW REAL-TIME AIDS, SERVICE-SPECIFIC SYSTEMS, AND TOOLS.	SEMI-AUTOMATED, INTER-OPERABLE, M&S-SUPPORTED SITUATIONAL ASSESSMENT, PLANNING, AND RESOURCE ALLOCATION. NEAR REAL-TIME 2D/3D VISUALIZATION.	FULLY AUTOMATED, INTEGRATED, REAL-TIME, M&S-SUPORTED GCCS APPLICATIONS THAT ARE SCALABLE AND TAILORABLE FROM CINC/JOINT STAFF LEVEL TO PLATFORM/ECHELON/WARFIGHTER. DYNAMIC EXECUTION MANAGEMENT. REAL-TIME 2D/3D VISUALIZATION.
ASSESSMENT AND STATUS REPORTING	NO EFFICIENT MEANS OF ASSESSING JOINT READINESS. READINESS DATA DISTRIBUTION NOT ECHELON AWARE. SECURE SYSTEMS ARE ONLY COMPONENT SOLUTIONS.	LIMITED AUTOMATED, M&S CAPABILITIES FOR ASSESSING JOINT READINESS. READINESS DATA DISTRIBUTION THAT IS COGNIZANT OF ECHELON, SPATIAL, AND TEMPORAL ISSUES. USE OF COTS FOR SECURE SYSTEM SOLUTIONS.	FULLY AUTOMATED, M&S-SUPPORTED CAPABILITIES FOR ASSESSING AND FORECASTING JOINT READINESS. FULL CINC-TO-FOXHOLE READINESS DATA DISTRIBUTION. FULL MLS CAPABILITY. REALISTIC ASSESSMENT TOOLS.

JOINT TRAINING READINESS

OBJECTIVE:

- DEVELOP ADVANCED JOINT FORCE PERFORMANCE ASSESSMENT AND TRAINING FEEDBACK TOOLS FOR ESTIMATING AND MAINTAINING TRAINING READINESS.
- DEMONSTRATE ASSESSMENT AND FEEDBACK TOOLS AND METRICS INTEGRATED WITH JOINT FIRES MISSION.



JUSTIFICATION:

- INADEQUATE TOOLS AND METHODS FOR ASSESSMENT AND FEEDBACK WITH JOINT DISTRIBUTED TRAINING.
- LIMITED TRAINING METHODS AND MANUALS FOR PLANNING AND EXECUTING JOINT MISSIONS.

SCHEDULE AND FUNDING:

MILESTONE	FY97	FY98	FY99	FY00
• Operational Ex Dev				
- Jt Fires scenarios				
- Training objs				
• Training Tool Dev				
- Perf Assessment				
- After Action Rev				
• Methods Guidance				
- Conducting Training				
- Readiness Est				
• Demo and Test	Δ	Δ	Δ	
Funding ($M)	3.8	4.3	4.3	2.6

APPROACH:

- PREPARE OBJECTIVES AND SCENARIOS LINKED TO JMET FOR JOINT FIRES TRAINING.
- DEVELOP PERFORMANCE ASSESSMENT TOOLS FOR JOINT TRAINING IN A DISTRIBUTED ENVIRONMENT.
- DESIGN AND EVALUATE AFTER ACTION REVIEW TOOLS FOR ACHIEVING TRAINING OBJECTIVES.
- ITERATIVELY TEST TOOLS AND METHODS AS PART OF OPERATIONAL EXERCISES.
- DESIGN METHODS TO LINK EXERCISE PERFORMANCE WITH TRAINING READINESS ESTIMATES AND COSTS.

JOINT TRAINING READINESS EXIT CRITERIA

OPERATIONAL CAPABILITY	BASELINE PERFORMANCE	MINIMUM EXIT CRITERIA	GOAL EXIT CRITERIA
METHODOLOGY FOR GENERATING JOINT TRAINING SCENARIOS FROM TRAINING OBJECTIVES (TOs)	MDT2 GUIDELINES ON SCENARIO DEVELOPMENT; CURRENT USACOM METHODOLOGY; SINGLE SERVICE DATA BASE METHODOLOGY, E.G., ASAT	ADAPTATION AND INTEGRATION OF BASELINE CAPABILITIES; VALIDATED GUIDELINES FOR MANUAL GENERATION	VALIDATED, SEMI-AUTOMATED TRAINING SCENARIO GENERATION
METRICS FOR HOW WELL JOINT FORCES COMMUNICATE, COORDINATE, AND SYNCHRONIZE RESOURCES IN EXECUTING THE MISSION	EVALUATION AND ASSESSMENT METRICS DEVELOPED IN THE MDT2 PROGRAM; CURRENT USACOM METHODOLOGY	ADAPTATION AND EXTENSION OF BASELINE METRICS FOR TRAINING IN JOINT FIRES	VALIDATED, SEMI-AUTOMATED TECHNIQUES FOR ASSESSING AND EVALUATING JOINT FORCE PLANNING AND EXECUTION
METHODS AND TOOLS FOR CONDUCTING VERTICAL AND HORIZONTAL JOINT SERVICE AFTER ACTION REVIEWS (AARs)	MDT2 AAR METHODOLOGY NTC AARs; SINGLE SERVICE AARs METHODOLOGY; DIS/ADS TOOLS AND SYSTEMS	ADAPTATION, VALIDATION, AND INTEGRATION OF BASELINE METHODOLOGIES INTO A CROSS-SERVICE COMPATIBLE SYSTEM; ENHANCED OBJECTIVITY OF EVALUATION AND PERFORMANCE ASSESSMENT	SEMI-AUTOMATED AAR ANALYSIS AND DISPLAY SYSTEM FOR JOINT SERVICE FIRES TRAINING; CAPABILITY TO SUPPORT AARs AND TRAINING READINESS REPORTING/ TRAINING COSTS

G. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION AND ADVANCED TECHNOLOGY DEMONSTRATION PROGRAM SUMMARIES FOR JOINT COUNTERMINE

G. JOINT COUNTERMINE

JOINT COUNTERMINE ACTD

OBJECTIVE:

- **DEMONSTRATE SEAMLESS TRANSITION OF COUNTERMINE CAPABILITIES FROM SEA TO LAND OPERATIONS**

MAJOR CHALLENGE:

- **INTEGRATION OF ARMY/NAVY/MARINE CORPS DEVELOPMENTAL SYSTEMS WITH FIELDED HARDWARE TO PRODUCE NEW COUNTERMINE OPERATIONS**

APPROACH:

- **CONDUCT TWO MAJOR DEMONSTRATIONS**

MILESTONES:

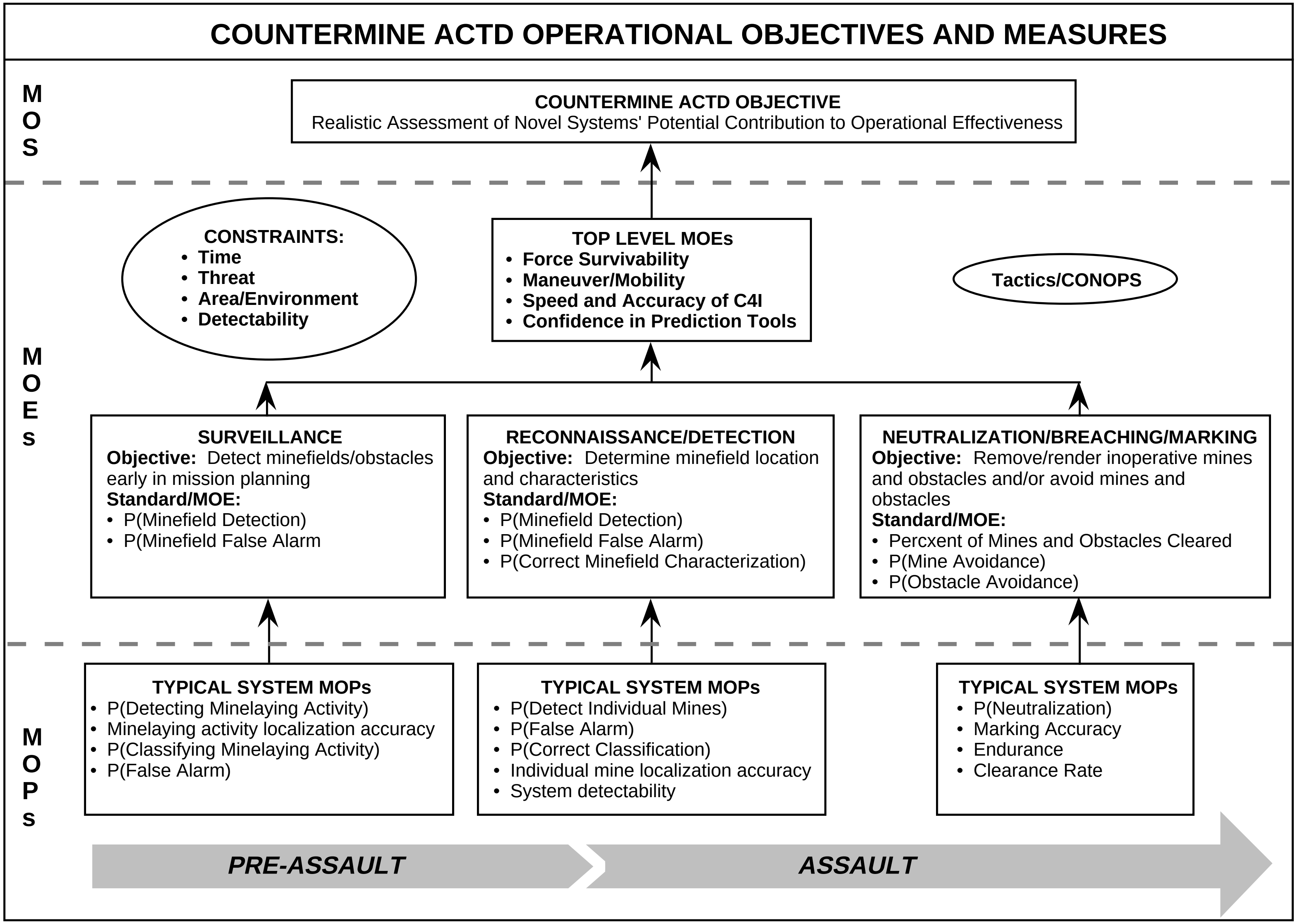
ACTD MANAGEMENT PLAN APPROVED................................. 3QFY95
JCOS PROGRAM... 2QFY95
C4I EXECUTION PLAN COMPLETE.. 4QFY96
CONDUCT DEMONSTRATION I.. 3AFY97
CONDUCT DEMONSTRATION II... 4QFY98
COMPLETE ANALYSIS OF DEMONSTRATION EVENTS......... 3QFY99
FOLLOW-ON SUPPORT AND EVALUATON............................. FY99-FY00

FUNDING:

SOURCE	FY95	FY96	FY97	FY98	FY99	FY00	TOTALS
OSD CM ACTD FUNDING							
ARMY	7.5	7.4	7.6	5.7	2.2	1.4	31.8
NAVY	5.6	6.8	8.1	10.1	3.9	1.5	37.8
SUBTASK	13.1	14.2	15.7	15.8	6.1	2.9	69.6

ACCOMPLISHMENTS:

- **JOINT PROJECT OFFICE ESTABLISHED**
- **CINC USACOM SIGNED ON AS "OPERATIONAL USER"**
- **PREPARED MANAGEMENT PLAN**
- **INITIATED JOINT COUNTERMINE OPERATIONAL SIMULATION (JCOS) AND JOINT CRI EFFORT**


COUNTERMINE ACTD OPERATIONAL OBJECTIVES AND MEASURES
MOS
COUNTERMINE ACTD OBJECTIVE
Realistic Assessment of Novel Systems' Potential Contribution to Operational Effectiveness
MOEs
CONSTRAINTS:
• Time
• Threat
• Area/Environment
• Detectability
TOP LEVEL MOEs
• Force Survivability
• Maneuver/Mobility
• Speed and Accuracy of C4I
• Confidence in Prediction Tools
Tactics/CONOPS
SURVEILLANCE
Objective: Detect minefields/obstacles early in mission planning
Standard/MOE:
• P(Minefield Detection)
• P(Minefield False Alarm
RECONNAISSANCE/DETECTION
Objective: Determine minefield location and characteristics
Standard/MOE:
• P(Minefield Detection)
• P(Minefield False Alarm)
• P(Correct Minefield Characterization)
NEUTRALIZATION/BREACHING/MARKING
Objective: Remove/render inoperative mines and obstacles and/or avoid mines and obstacles
Standard/MOE:
• Percxent of Mines and Obstacles Cleared
• P(Mine Avoidance)
• P(Obstacle Avoidance)
MOPs
TYPICAL SYSTEM MOPs
• P(Detecting Minelaying Activity)
• Minelaying activity localization accuracy
• P(Classifying Minelaying Activity)
• P(False Alarm)
TYPICAL SYSTEM MOPs
• P(Detect Individual Mines)
• P(False Alarm)
• P(Correct Classification)
• Individual mine localization accuracy
• System detectability
TYPICAL SYSTEM MOPs
• P(Neutralization)
• Marking Accuracy
• Endurance
• Clearance Rate
PRE-ASSAULT
ASSAULT

VEHICLE MOUNTED MINE DETECTOR ATD

OBJECTIVE:

- EVALUATE AND DEMONSTRATE THE MATURITY OF A VEHICULAR MOUNTED MINE DETECTOR THAT DETECTS METALLIC AND NONMETALLIC MINES AT TACTICAL SPEEDS.

JUSTIFICATION:

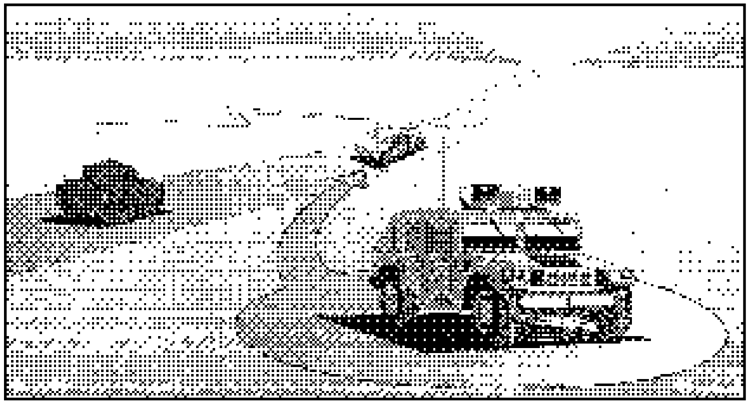
- PROVIDE FIRST TIME CAPABILITY TO DETECT MINES ACROSS FULL WIDTH OF VEHICLE.
- IMPROVE SURVIVABILITY BY AVOIDING MAIN SOURCE OF VEHICULAR LOSSES IN MOST CONFLICTS (INCLUDING OOTW)

BATTLELAB:

- MOUNTED BATTLESPACE
- MCCDC

PEO:

- ASM
- MARCORSYSCOM



SCHEDULE AND FUNDING:

Milestones	FY94	FY95	FY96	FY97
6.2 Exploratory Develop.				
Systems Integ/Shakedown				
Arid Field Exercise				
Temperate Field Exercise				
Data Analysis				
Systems Modifications				
Arid & Temperate Field Demos				
Milestone I				
FUNDING: Total ($22.1M)	3.7	4.4	4.7	6.4

APPROACH:

- DEMONSTRATOR DEVELOPMENT
  - DEVELOP TWO MULTISENSOR SUITE APPROACHES
  - HIGH RESOLUTION X-RAY IMAGING
  - DOWN & FORWARD LOOKING GROUND PENETRATING RADARS
  - FORWARD LOOKING IR
- TD PHASE
  - TEST IN ARID & TEMPERATE REALISTIC TERRAINS & CLUTTER
  - TEST IN OPERATIONAL SCENARIOS
  - TEST BEST SENSORS OR COMBINATIONS

APPLICATIONS:

- COUNTERMINE TOP LEVEL DEMO (TLD)
- ADVANCED LAND COMBAT
- JOINT COUNTERMINE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION (ACTD)

VEHICLE MOUNTED MINE DETECTOR ATD EXIT CRITERIA				
	OFF ROAD (Dense, Scatterable Minefield)		**ON ROAD (Low Density Minefield)**	
OPERATIONAL CHARACTERISTIC	ARID	TEMPERATE	ARID	TEMPERATE
DETECTOPM SPEED (km/hr)	2	2	3.6	3.6
PROBABILITY OF DETECTION (%)				
AT SURFACE	85	85	90	90
AT BURIED	70	70	75	75
MAXIMUM FALSE ALARM RATE (Per Meter of Forward Progress)	0.2	0.2	0.05	0.05
SYSTEM POWER REQUIREMENT (kw)	5	5	5	5
PER UNIT PRODUCTION COST ($K)	324	324	324	324

CLOSE-IN MAN PORTABLE MINE DETECTOR (CIMMD) ATD

OBJECTIVES:

- **EVALUATE AND DEMONSTRATE THE MATURITY OF DIFFERENT TECHNOLOGY OPTIONS OR COMBINATIONS OF TECHNOLOGIES TO RELIABLY DETECT METALLIC AND NON-METALLIC ANTI-PERSONNEL AND ANTI-TANK MINES BY DISMOUNTED PERSONNEL**
- **P_D: 92% FOR METALLIC AP AND AT MINES**
  80% FOR NON-METALLIC AT MINES
  50% FOR NON-METALLIC AP MINES
- **FAR: <0.2 PER M^2**

CHALLENGE:

- **DISCRIMINATION FOR MINES FROM CLUTTER IN VARIOUS ENVIRONMENTS**

1995 ACCOMPLISHMENTS:

- **SUCCESSFUL ATD FIELD TEST/DEMO OF GROUND PENETRATING RADAR AND THERMAL IMAGING TECHNOLOGIES AT ABERDEEN PROVING GROUND, MD, AND YUMA PROVING GROUND, AZ**

MILESTONES AND FUNDING ($M):

Activities	FY95	FY96	FY97
PROTOTYPE DEVELOPMENT			
SEPARATED APERTURE			
BALANCED BRIDGE			
SYNTHETIC PULSE			
THERMAL IMAGING			
COMMERCIAL DEVICES			
FINAL IMPLEMENTATION & DEMO			
ORD APPROVAL			
MILESTONE I IPR			
AWE			

PE	FY95	FY96	FY97
0603606A	3.80	—	—

APPROACH:

PROTOTYPE DEVELOPMENT

- **DEVELOP DIVERSE TECHNOLOGIES**
- **EMPHASIZE DEVELOPMENT OF DETECTOR FRONT ENDS AND DETECTION ALGORITHMS**
- **USE REALISTIC SIGNATURES AND CLUTTER**

ATD TESTING PHASE

- **COMMERCIAL DETECTORS EVALUATION**
- **DETERMINE BEST TECHNOLOGIES OR COMBINATION**
- **SOLDIER SKILL LEVEL AND HUMAN ENGINEERING TESTING**
- **TEST IN DIFFERENT ENVIRONMENTS**

CLOSE-IN MAN PORTABLE MINE DETECTOR ATD EXIT CRITERIA

PROBABILITY OF DETECTION (%)*

- AT METALLIC 92
- AT NON-METALLIC 80
- AP METALLIC 92
- AP NON-METALLIC 50

FALSE ALARM RATE*

- 1 PER 55 SQ. FT

SCAN RATE

- 90 SQ. FT./MIN.

*ALL SOIL TYPES AND ENVIRONMENTS

OFF-ROUTE SMART MINE CLEARANCE (ORSMC) ATD

OBJECTIVES:

- **DEVELOP TECHNOLOGIES AND CONCEPTS TO NEUTRALIZE ADVANCED TOP AND SIDE-ATTACK ANTI-TANK MINE SYSTEMS**
- **CLEAR WAY FOR OBSTACLE BREACHING AND MAIN SUPPLY ROUTE CLEARING OPERATIONS**
- **REMOTE CONTROL, DAY/NIGHT OPERATION, 20 KPH**
- **90% PROBABILITY OF ACTUATING OFF-ROUTE SMART MINES WITHIN LETHAL RANGE OF THE PATH OF TRAVEL**

CHALLENGE:

- **ACTUATION OF OFF-ROUTE SMART MINE WHILE SURVIVING SMART MINE SUBLET**

1995 ACCOMPLISHMENTS:

- **UPGRADED SURROGATE GROUND SENSOR SYSTEM ALGORITHM AND INITIATED SUBLET SIMULATION CAPABILITY FOR INTEGRATION IN FY95**
- **DEVELOPED IMPROVED SYNTHETIC ACOUSTIC SIGNATURE GENERATION CAPABILITY**
- **SUCCESSFULLY TESTED ACOUSTIC SIGNATURE GENERATION ON A HMMWV**
- **LEVERAGED TECHNOLOGY FROM SIGNATURE MANAGEMENT COMMUNITY FOR ORSMC SURVIVABLITY**
- **STUDIED UNMANNED GROUND VEHICLE ALTERNATIVES**

MILESTONES AND FUNDING ($M):

Activities	FY93	FY94	FY95	FY96	FY97
ATD Approval					
Develop Ground Sensor CM					
Develop Terminal Sensor CM					
Enhance Threat Emulator					
Encounter Model					
ORSMC System Integration					
ORSMC Demonstration					

PE	FY93	FY94	FY95	FY96	FY97
0602786A	—	1.200	1.615	—	—
0603606A	—	—	1.000	1,761	—
0603640M	—	1.200	1.600	2,400	—

APPROACH:

- **PROJECTS MULTI-SPECTRAL TARGET SIGNATURES TO INITIATE MINE**
- **MISDIRECTS MINE SUBLET TOWARD FALSE ACOUSTIC/IR TARGET**
- **EVADES SMART MINE MUNITIONS THROUGH SIGNATURE MANAGEMENT TECHNOLOGIES**
- **USES REMOTE CONTROL TO PROTECT OPERATOR**

OFF-ROUTE SMART MINE CLEARANCE ATD EXIT CRITERIA		
CATEGORY	BASELINE	ATD GOAL
COVERAGE AREA/NEUTRALIZATION PROBABILITY	NONE	100 METER RADIUS/90% OF ALL OFF-ROUTE SMART MINES
NEUTRALIZATION SPEED	NONE	20 MPH
SURVIVABILITY	NONE	75% PROBABILITY OF SURVIVING LAUNCHED WARHEAD
OPERATING ENVIRONMENT	NONE	24-HOUR/LIMITED TERRAIN
VEHICLE CONTROL	NONE	REMOTE CONTROL/NO OPERATOR EXPOSURE

JOINT AMPHIBIOUS MINE COUNTERMEASURE (JAMC) ATD

OBJECTIVES:

- EVALUATE AND DEMONSTRATE INTEGRATED EXPLOSIVE ELECTROMAGNETIC AND MECHANICAL TECHNOLOGIES WITH TELEOPERATED BULLDOZER SYSTEM DELIVERY FROM THE SEA
- LINE-OF-SIGHT TELEOPERATION, DAY/NIGHT @ BEACH
- 90% MINE CLEARANCE, 50x50 YD AREA, IN 1.5 HOURS
- HARDENED AGAINST SMALL ARMS, ARTILLERY, AND AT MINES

CHALLENGE:

- RAPID CLEARANCE OF SURF/BEACH ZONE MINES AND OBSTACLES FROM A SURVIVABLE PLATFORM

1995 ACCOMPLISHMENTS:

- COMPLETED PHASE I HARDWARE FABRICATION
- COMPLETED PHASE I SYSTEM INTEGRATION
- COMPLETED DT TESTING
- CONDUCTED OPERATIONAL DEMO

MILESTONES AND FUNDING ($M):

Activities	FY93	FY94	FY95	FY96	FY97	FY98
System Design						
Tool Development						
System Integration						
Development Test						
Operator Test						
ATD Demo						
MS I/II						
Phase II Develop.						
Phase II Testing						
PE	**FY93**	**FY94**	**FY95**	**FY96**	**FY97**	**FY98**
0602786A	—	3.44	3.60	2.50	1.00	

APPROACH:

- TELEOPERATED AND ARMORED D7 BULLDOZERS UTILIZING MINE RAKE AND SIGNATURE DUPLICATION SYSTEMS
- MAGNETIC CHAIN ARRAY
- MECHANICAL DEPLOYMENT OF EXPLOSIVE NETS
- M&S FOR OPERATIONAL INSIGHTS AND TTPs
- PRECISION ELECTRONIC NAVIGATION AND REAL-TIME MARKING

JOINT AMPHIBIOUS MINE COUNTERMEASURE (JAMC) ATD EXIT CRITERIA

GOAL/OBJECTIVE MOP VALUES:

AREA CLEARED	50 YDS BY 50 YDS
MINE THREAT	NEUTRALIZE ALL MINE TYPES (SURFACE LAID TO 5" OVERBURDEN BURIED)
CLEARANCE TIME	1.5 HOURS
CLEARING EFFECTIVENESS:	90 PERCENT OF ALL MINES NEUTRALIZED

COASTAL BATTLEFIELD RECON AND ANALYSIS (COBRA) ATD

OBJECTIVES:

- **DEVELOP ADVANCED MULTI-SPECTRAL IMAGING SENSORS FOR USE IN UAV FOR BATTLEFIELD RECONNAISSANCE AND MINE DETECTION**
- **OPERATION FROM BEACH TO INLAND, DAY/NIGHT**
- **500 FT ALTITUDE @ 60 KNOTS WITH 0.85 SQUARE NAUTICAL MILE/HOUR COVERAGE**
- **P_D: 90% SURFACE MINEFIELD**
  70% BURIED MINEFIELD

CHALLENGE:

- **DISCRIMINATION OF MINES AND OBSTACLES FROM CLUTTER IN BEACH TO INLAND**

1995 ACCOMPLISHMENTS:

- **COMPLETED HARDWARE DESIGN**
- **COMPLETED MINEFIELD DETECTION ALGORITHMS**
- **BEGAN DEVELOPMENTAL TESTING**

MILESTONES AND FUNDING ($M):

Activities	FY93	FY94	FY95	FY96	FY97
Baseline Field Test					
Advanced Sensor Test					
Enhanced Sensor Early Operational Assessment					
ATD					
MSI					
PE	**FY93**	**FY94**	**FY95**	**FY96**	**FY97**
0603640M	—	3.00	2.00	1.90	—

APPROACH:

- **INTEGRATE MULTI-SPECTRAL CAMERA INTO PIONEER UAV (PHASE I)**
- **USE CURRENT IMAGE PROCESSING TO ESTABLISH BASELINE CAPABILITY (PHASE I)**
- **DEVELOP ENHANCED SENSOR AND OPTICS PACKAGE FOR FIXED-WING ASSETS (PHASE II)**
- **RESOLVE COREGISTRATION ISSUE FOR MULTISPECTRAL IMAGES (PHASE II)**
- **BUILD, INTEGRATE, AND TEST ENHANCED SENSOR, DATA LINK, AND PROCESSING PACKAGE ON FIXED-WING ASSETS (PHASE III)**
- **USE PERFORMANCE MODELING FOR FOLLOW-ON EFFORT (PHASE III)**

COASTAL BATTLEFIELD RECON & ANALYSIS (COBRA) EXIT CRITERIA

GOAL/OBJECTIVE MOP VALUES:

COVERAGE RATE	1.36 NAUTICAL MILES PER HOUR
PROBABILITY OF DETECTION	SURFACE MINES—0.8; BURIED MINES—0.7
PROBABILITY OF MINEFIELD FALSE ALARM	0.3
ACCURACY OF MINEFIELD LOCATION	TO BE DETERMINED
PROCESSING TIME	NEAR REAL TIME

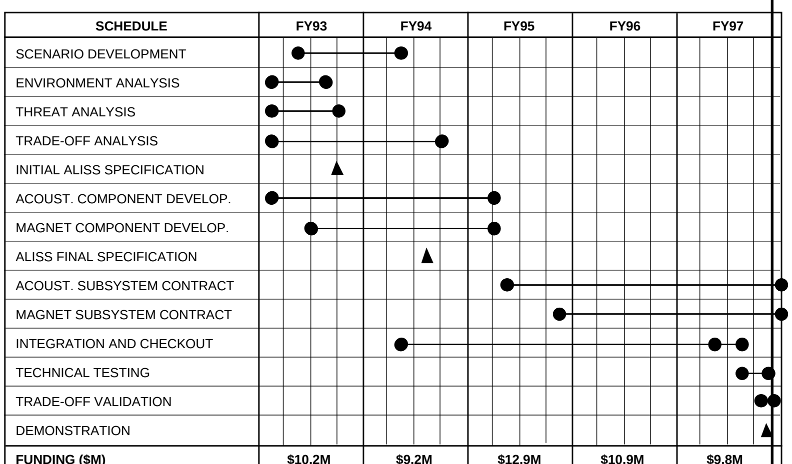
ADVANCED LIGHTWEIGHT INFLUENCE SWEEP SYSTEM ATD

OBJECTIVE:

- **SIGNIFICANT ADVANCE IN MCM CAPABILITY BY DEVELOPING A LIGHTWEIGHT, HIGH OUTPUT, LOW DRAG ACOUSTIC AND MAGNETIC MINESWEEPING SYSTEM FOR HIGH SPEED AMPHIBIOUS ASSAULT MINE COUNTERMEASURES AND OTHER MCM SWEEP MISSIONS**

NOT AVAILABLE

MILESTONES AND FUNDING ($M):



TECHNICAL APPROACH:

- **DEVELOP SPARK GAP ACOUSTIC SOURCE**
- **DEVELOP SUPERCONDUCTING MAGNETIC SOURCE**
- **INTEGRATE INTO COMBINED INFLUENCE MINESWEEPING SYSTEM**
- **DEMONSTRATE ONBOARD SMALL ACV**

ADVANCED LIGHTWEIGHT INFLUENCE SWEEP SYSTEM ATD EXIT CRITERIA

FY96: SUCCESSFUL PREPARATIONS OF ACOUSTIC AND MAGNETIC SUBSYSTEMS (SPARK GAP AND SUPERCONDUCTING MAGNET) FOR NEXT FISCAL YEAR'S DEMONSTRATION.

FY97: SUCCESSFUL DEMONSTRATION OF THE LIGHTWEIGHT INFLUENCE SWEEP SYSTEM FOR THE JOINT COUNTERMINE ACTD.

EXPLOSIVE NEUTRALIZATION

OBJECTIVE: • SUPPORT JOINT LITTORAL WARFARE REQUIREMENT OF IN-STRIKE MINE AND OBSTACLE BREACHING THROUGH THE CLZ	NOT AVAILABLE
MILESTONES AND FUNDING ($M): NOT AVAILABLE	***S&T FOCUS:*** • EXTENDED RANGE AND IMPROVED PLACEMENT ACCURACY FOR SURFACE LAUNCHED CLERANCE SYSTEMS (DET AND SABRE) • ALTERNATIVE EXPLOSIVE ARRAY DEPLOYMENT OPTIONS • ENHANCED EXPLOSIVE PERFORMANCE

EXPLOSIVE NEUTRALIZATION ATD EXIT CRITERIA

FY96: SUCCESSFUL SURF ZONE ARRAY EXPLOSIVE TEST TO DEMONSTRATE TRANSFER BETWEEN SUBSYSTEM PANELS AND SUCCESSFUL BEACH ZONE ARRAY LETHALITY TEST AGAINST A SIMULATED MINE THREAT. SUCCESSFUL FULL SCALE DEPLOYMENT OF AN INERT ROPE SURF ZONE ARAY WITH A LIVE SMX-13 EXPLOSIVE PANEL FROM A LAND-BASED MOTION PLATFORM, AND SCALED DEPLOYMENT OF THE BEACH ZONE ARRAY FROM A REMOTELY OPERATED POWERED AIRFRAME.

FY97: SUCCESSFUL DEMONSTRATION OF SURF ZONE AND LANDING CRAFT DEPLOYMENT ACCURACY TESTS FROM AN LCAC (AIR CUSHIONED LANDING CRAFT) DURING SEA STATE TWO OR LESS ENVIRONMENTAL CONDITIONS.

FY98: SUCCESSFUL FULL SYSTEM DEMONSTRATION ACCURACY/EXPANSION OF A SCALED BEACH ZONE ARRAY BEING EXTRACTED FROM AN UNPOWERED GLIDER, RELEASED FROM AN APPROPRIATE STANDOFF DISTANCE.

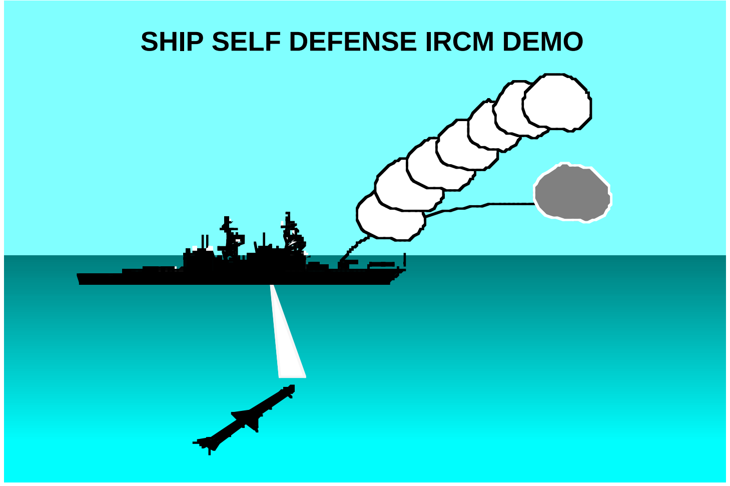
H. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION
AND ADVANCED TECHNOLOGY DEMONSTRATION
PROGRAM SUMMARIES
FOR ELECTRONIC WARFARE

H. ELECTRONIC WARFARE

SHIP SELF DEFENSE AGAINST IR MISSILES

OBJECTIVE:

- DEMONSTRATE INTEGRATED IRCM CAPABILITY FOR SHIP SELF DEFENSE EMPLOYING FLARES, IR CHAFF, IRST/CUEING SYSTEM, AND LASER-BASED IRCM TECHNOLOGY.
- PROVIDE TRANSITION BRIDGE BETWEEN LAND-BASED MATES ATD AND E&MD TO REDUCE RISK AND COST.



SCHEDULE AND FUNDING:

MILESTONES		FY99	FY00	FY01
DEVELOP/TEST SEA-BASED MATES SYSTEM				
INTEGRATE NAVY IRST TESTBED SYSTEM				
DEVELOP NAVY IRST TESTBED SOFTWARE				
VALIDATE THREAT SYSTEMS FOR CAPTIVE CARRY TESTING				
INTEGRATE ADVANCED FLARE/CHAFF WITH MK-36				
DEVELOP DISPENSING SOFTWARE				
DISPENSER/CUEING SYSTEM INTEGRATION				
CAPTIVE CARRY FLIGHT TEST/REPORT				Δ
FUNDING ($M)	REQUIRED	6.9	5.7	4.3

APPROACH:

- DEVELOP LASER-BASED IRCM SYSTEM (MATES) FOR AT-SEA TESTING
- INTEGRATE EXISTING/ADVANCED OFF-BOARD COUNTERMEASURES WITH EXTERNAL CUEING
- MEASURE INTEGRATED IRCM EFFECTIVENESS AGAINST SIMULATORS REPRESENTING CURRENT/ADVANCED IR THREAT SEEKERS
- CAPTIVE CARRY FLIGHT TEST IN REALISTIC SHIPBOARD ENVIRONMENT

SHIP SELF DEFENSE AGAINST IR MISSILES

- FY98 — ACCEPTANCE OF FINAL SYSTEM DESIGN
- FY99 — SYSTEM MODEL AND OPERATION SIMULATION CAPABILITY DEMONSTRATED
- FY00 — COMPLETION OF SYSTEM LAND-BASED CHECK OUT AND TESTING AT NRL/CBD
- FY01 — DEFEAT OF CAPTIVE-CARRY ADVANCED ANTISHIP MISSILE SIMULATORS, LIVE-FIRED MAVERICK, AND CLUSTER SUMMIT ASMs DURING AT-SEA DEMONSTRATION

MULTISPECTRAL COUNTERMEASURES ATD

OBJECTIVE:

- **DEMONSTRATE A MULTI-SOURCE COUNTERMEASURE SOLUTION THAT WILL BE CAPABLE OF COUNTERING BOTH PRESENT AND FUTURE MULTI-COLOR IMAGING FOCAL PLANE ARRAY AND NON-IMAGING MISSILE SEEKERS.**

JUSTIFICATION:

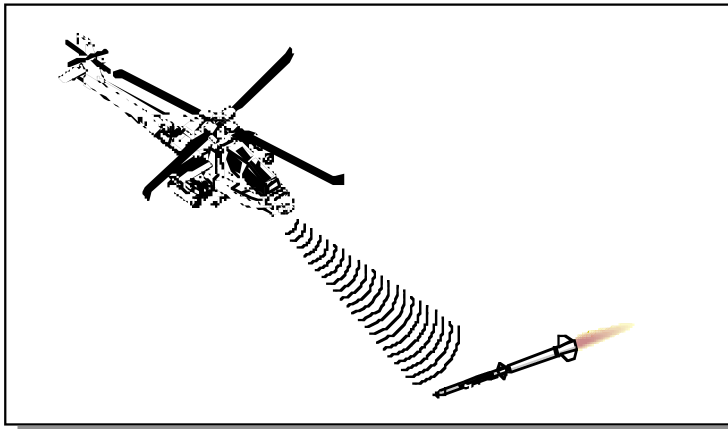
- **ENHANCED SURVIVABILITY OF DEEP ATTACK SYSTEMS**
- **IMPROVE MOUNTED FORCES MOBILITY**
- **IDENTIFY AND ENGAGE DEEP TARGETS WITH EARLY ENTRY FORCES**

BATTLELAB

- **MOUNTED BATTLE LAB**

PEO:

- **AVIATION**



SCHEDULE AND FUNDING:

MILESTONES	FY96	FY97	FY98	FY99
SUPPORTING ARMY ECM EFFECTS TESTS				
VERIFY MULTI-LINE ECM				
VERIFY ECM WITH TRACKER				
RECEIVE RF SOURCES				
INTEGRATE WITH ATIRCM				
LAB TESTS				
LIVE FIRE TESTS				
FUNDING ($M)		8.4	4.0	6.0

APPROACH:

- **UTILIZE ATIRCM/TRI-SERVICE COMMON MISSILE WARNING SYSTEM (CMWS) SENSORS AND PROCESSOR AS CORE SYSTEM HARDWARE.**
- **LEVERAGE TRI-SERVICE DEVELOPMENT AND TESTING OF LASER AND ECM WAVEFORMS.**
- **UPGRADE JAMMING CAPABILITY WITH MULTI-LINE LASER.**
- **CONDUCT LIVE FIRE CABLE CAR TEST VERSUS IMAGING SAMs.**
- **TRANSITION TO SURVIVABLE ARMED RECONNAISSANCE ON THE DIGITAL BATTLEFIELD ACTD.**

APPLICATIONS:

- **TRI-SERVICE ATIRCM/CMWS IMPROVEMENTS**
- **INTEGRATED SUITE OF ASE**

MULTISPECTRAL COUNTERMEASURE ATD EXIT CRITERIA				
	BASELINE		ATD	
OPERATIONAL CAPABILITY	144A	ATIRCM	MINIMUM	GOAL
• EFFECTIVENESS				
– CONSCAN AND PSUEDO IMAGING	<50%	<90%	<95%	<99%
– IMAGING	NONE	90%	95%	99%
– MULTI-COLOR	NONE	NONE	95%	99%
• J/S RATIO	4 / 1	1,000 / 1	10,000 / 1	>10,000 / 1
• MISSILE DETECTION RANGE	ACTIVE	2–3 KM	3–5 KM	>5 KM
• TRACKING ACCURACY	SYSTEM	1 MRAD	1 MRAD	100 μRAD

HIT AVOIDANCE ATD

OBJECTIVE:

- DEMONSTRATE ADVANCED HIT AVOIDANCE TECHNOLOGY FOR GROUND COMBAT HEMISPHERICAL PROTECTION AGAINST SMART THREATS.
- DEVELOP SYSTEM SPECIFICATION FOR ACTIVE PROTECTION BASED ON FIELD DEMONSTRATION.
- PROVIDE HIT AVOIDANCE ENGINEERING PERFORMANCE MODELS.
- TRANSFER UNIVERSAL THREAT RESOLUTION MODULE (DECISION AID) TO ENGINEERING DEVELOPMENT.
- IDENTIFY AFFORDABLE FORCE PROTECTION TECHNOLOGIES THROUGH CONTINUED GUARDIAN ANALYSIS.

JUSTIFICATION:

- CREW SURVIVABILITY AGAINST SMART THREATS
- OPERATIONAL ADVANTGES
  - PROVIDES CAPABILITY TO CONTROL TEMPO OF BATTLE AND MAINTAIN THE INITIATIVE
  - INCREASED SITUATION AWARENESS

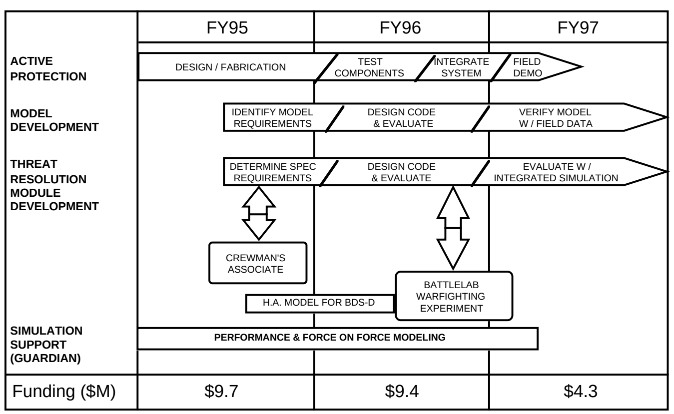
BATTLELAB:

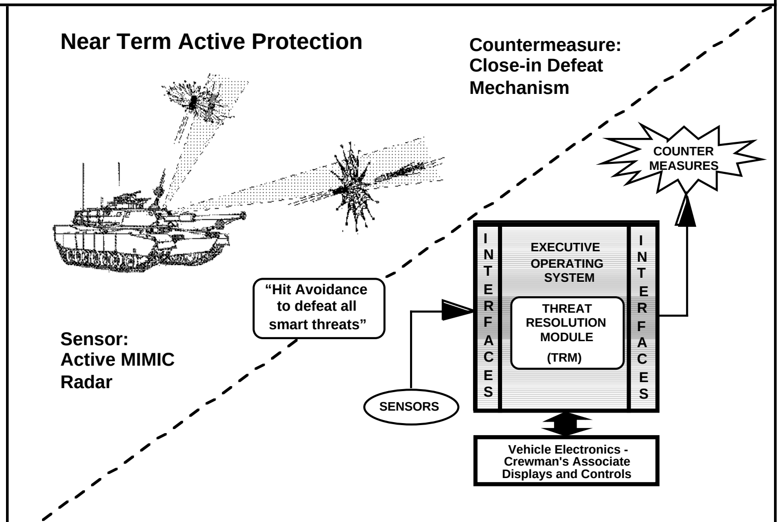
- MOUNTED BATTLESPACE

PEO:

- ASM

SCHEDULE AND FUNDING





APPROACH:

- INTEGRATE A MIMIC RADAR WITH A CLOSE-IN DEFEAT CM AND DEMONSTRATE IN THE FIELD
- DEVELOP THREAT RESOLUTION MODULE THAT CORRELATES, IDENTIFIES, AND PRIORITIZES THE THREAT AND RECOMMENDS OPTIMAL COUNTERMEASURE
- VERIFY AND MATURE TRM THROUGH LABORATORY EVALUATIONS
- CONTROL AND DISPLAY REQUIREMENTS DEVELOPED IN CONJUNCTION WITH CREWMAN'S ASSOCIATE ATD
- DETERMINE USER REQUIREMENTS THROUGH BATTLELAB WARFIGHTING EXPERIMENT
- ASSESS AFFORDABILITY CASTFOREM
- DEVELOP INITIAL TDPs
- LEVERAGE EXISTING PROGRAMS FROM ARPA, CECOM, AVSCOM, ERDEC, ARL, PMs, AND AIR FORCE
- UTILIZE UNIVERSITY, INDUSTRY, AND INTERNATIONAL TECHNOLOGY

APPLICATIONS:

- SURVIVABILITY UPGRADES (ABRAMS, BRADLEY)
- EMERGING SYSTEMS (AGS, AFAS, BREACHER)

HIT AVOIDANCE ATD EXIT CRITERIA				
THREAT	**SENSOR**	COUNTERMEASURE	EXPECTED EFFECTIVENESS	**EXIT CRITERIA**
A	MWS	IR FALSE TARGET GENERATOR	0.86	0.81
B	MWS/ACTIVE RADAR	ACTIVE PROTECTION SYSTEM	0.77	0.73
C	MWS/ACTIVE RADAR	ACTIVE PROTECTION SYSTEM	0.77	0.73
D	MWS	MISSILE COUNTERMEASURE DEVICE	0.90	0.85
	MWS/ACTIVE RADAR	ACTIVE PROTECTION SYSTEM	0.81	0.77
E	MWS/ACTIVE RADAR	ACTIVE PROTECTION SYSTEM	0.77	0.73

MWS = MISSILE WARNING SENSOR

MINIATURE AIR-LAUNCHED DECOY

OBJECTIVE:

- **INTENSIFY THE FOG OF WAR OVER THE BATTLEFIELD**
- **POPULATE ENEMY AIRSPACE WITH CONFUSION**
- **INCREASE EFFECTIVENESS AND SURVIVABILITY OF SEAD AND STRIKE AIRCRAFT**

TECHNOLOGY:

- **ENGINES FROM ARPA's SENGAP PROGRAM**
- **MATURED AIRFRAME AND AVIONICS**
- **PAYLOADS FROM WRIGHT LABORATORY "DILUTION DRONE" PROGRAM**

RESIDUALS:

- **>20 MALDs, CERTIFIED AIRCREWS, AND AIRCRAFT**

FUNDING:

	FY95	FY96	FY97	FY98	FY99	TOTAL
62702E	0	4.4	19.1	14.0	5.5	43.0

PLAYERS:

- **ARPA—DEMONSTRATION MANAGER**
- **USAF—ASC, WRIGHT LABORATORY, ACC/DR**
- **USN—NAVAIR (MONITORING)**
- **USA—MICOM (SENGAP)**

SCHEDULE:

- **DESIGN AND TEST FY 96-98**
- **DEMONSTRATION FY99**
- **IMPLEMENTATION DIR OUT FOR SIG (ACC)**

MINIATURE AIR-LAUNCHED DECOY (MALD) EXIT CRITERIA

- THIS ACTD PROGRAM WILL CONCENTRATE ON DEVELOPING THE NECESSARY TECHNICAL AND OPERATIONAL PERFORMANCE INTO THE MALD DECOY AND THEN PRODUCING IT IN LIMITED NUMBERS TO MEET VERY STRINGENT COST GOALS. AFFORDABILITY, ALONG WITH ACCEPTABLE PERFORMANCE, IS A CRITICAL MEASURE OF SUCCESS IN THE MALD PROGRAM.

- TO BE SUCCESSFUL, AND TO MEET THE ACTD GOALS, MALD MUST ACCOMPLISH THE FOLLOWING:

  — DEMONSTRATE THE REQUIRED LEVEL OF SATURATION AND CONFUSION IN THREAT AIR DEFENSE NETWORKS THROUGH EXHAUSTIVE FLIGHT TESTING.

  — DEMONSTRATE THAT MALD, IN PRODUCTION, CAN MEET UNIT FLYAWAY PRICE (UFP) COST GOALS.

  — DEMONSTRATE THAT MALD CAN BE SAFELY CARRIED AND LAUNCHED FROM THE CARRIER AIRCRAFT.

  — DEMONSTRATE THAT MALD WILL PROVIDE THE REQUIRED RCS AUGMENTATION, RANGE, AIRSPEED, ENDURANCE, AND OPERATIONAL ALTITUDE PERFORMANCE, AND FLIGHT PROFILE NAVIGATION ACCURACIES.

  — DEMONSTRATE THAT MALD WILL MEET STORAGE AND LIFETIME REQUIREMENTS.

  — DEMONSTRATE THAT MALD WILL MEET ALL OTHER USER OPERATIONAL REQUIREMENTS.

  — MEET ALL CONTRACTUAL COST AND SCHEDULE MILESTONES AND GOALS.

I. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION AND ADVANCED TECHNOLOGY DEMONSTRATION PROGRAM SUMMARIES FOR INFORMATION WARFARE

I. INFORMATION WARFARE

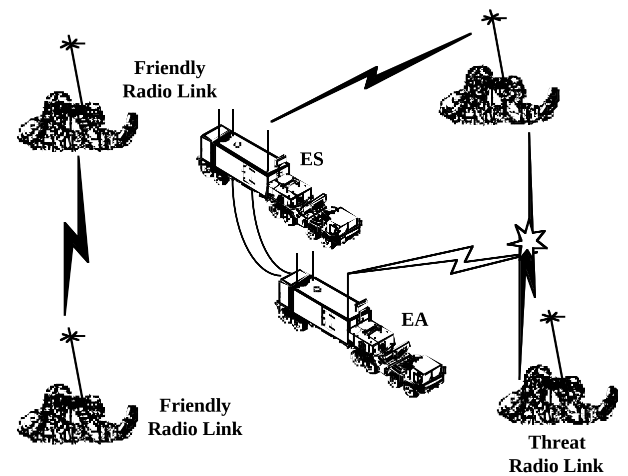
DIGITAL COMMUNICATIONS ELECTRONIC ATTACK

OBJECTIVE:

- PROVIDE THE CAPABILITY TO INTERCEPT AND BRING UNDER ELECTRONIC ATTACK ADVANCED DIGITAL COMMUNICATIONS SIGNALS.
- DISRUPT, DENY, AND/OR MODIFY BY DECEPTIVE TECHNIQUES TO RENDER THE COMMUNICATIONS SYSTEM INEFFECTIVE AND UNRELIABLE.
- FOCUS ON DIGITAL FORMATS BEING IMPLEMENTED IN DATA TRANSMISSION SYSTEMS IMPLEMENTED BY A VARIETY OF MODERN TECHNOLOGIES AND ADVANCED COMMUNICATIONS SYSTEM.

JUSTIFICATION:

- THESE ARE COMMUNICATIONS SYSTEMS IN USE TODAY.
- ARE BEING FURTHER TECHNOLOGICALY DEVELOPED.
- ARE RECOGNIZED AS THREAT CAPABILITIES.
- ENABLE THE FORCE TO WAGE AGGRESSIVE OFFENSIVE INFORMATION WARFARE.



SCHEDULE AND FUNDING:

Milestone	FY96	FY97	FY98	FY99	FY00	FY01
ES & EA Strategy Development						
EA Strategy Analysis & Validation						
Data Transmission/ Modem ES & EA Strategy Development						
Modem Comm ES & EA Strategy Develop.						
Network ES & EA						
ES/EA Transition to IEWCS						
Funding ($M)	2.9	4.7	4.7	5.0	0	0

APPROACH:

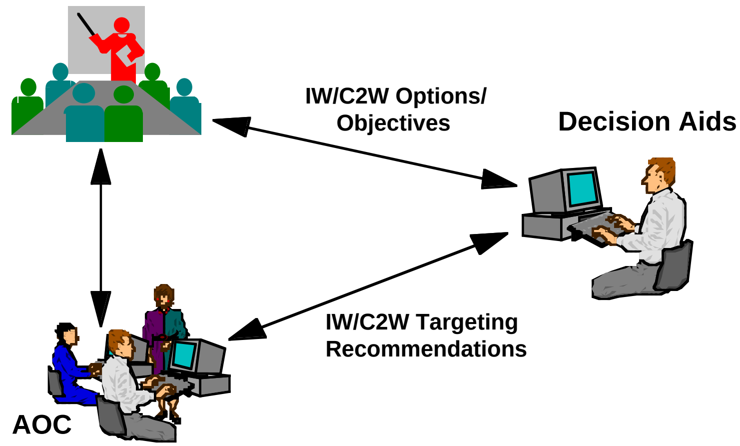
- LEVERAGE OFF INTERCEPT TECHNOLOGY TECHBASE PROGRAMS.
- LEVERAGE RESULTS OF MODULATION/MODERN FORMAT RECOGNITION PROGRAMS
- UTILIZE SIMULATION WORKSTATION FOR DIGITAL SIGNAL EA STRATEGIES.
- VALIDATE EA STRATEGIES THROUGH SIMULATION AND EMULATORS.
- TRANSITION ES/EA ALGORITHMS TO IEWCS.

DIGITAL COMMUNICATIONS ELECTRONIC ATTACK EXIT CRITERIA		
OPERATIONAL CAPABILITY	**CURRENT CAPABILITY**	**END GOALS**
OBJECTIVE:		
PROVIDE THE CAPABILITY TO INTERCEPT AND BRING UNDER ELECTRONIC ATTACK ADVANCED DIGITAL COMMUNICATIONS SIGNALS.	CLASSIFIED	CLASSIFIED
DISRUPT, DENY, AND/OR MODIFY BY DECEPTIVE TECHNIQUES TO RENDER THE COMMUNICATIONS SYSTEM INEFFECTIVE AND UNRELIABLE.	CLASSIFIED	CLASSIFIED
FOCUS ON DIGITAL FORMATS BEING IMPLEMENTED IN DATA TRANSMISSION SYSTEMS IMPLEMENTED BY A VARIETY OF MODERN TECHNOLOGIES AND ADVANCED COMMUNICATIONS SYSTEMS.	CLASSIFIED	CLASSIFIED

INFORMATION WARFARE PLANNING TOOL (PROPOSED ACTD)

OBJECTIVE:

- DEMONSTRATE IN-THEATER OFFENSIVE IW PLANNING AIDS THAT HELP QUICKLY CHOOSE IW OPTIONS VIA MODELING AND SIMULATION TOOLS.
- ALLOW CINCs TO CHOOSE BEST IW TOOLS AND TARGETS, INTEGRATE LETHAL AND NONLETHAL OPTIONS TO SUPPORT OBJECTIVES.



TECHNOLOGY:

- HIGH PROCESSING POWER, ADVANCED DISPLAYS, FLEXIBLE DATA BASE ENGINE, COMM CONNECTIVITY

FUNDING (Budget and POM, $M):

	FY97	FY87	FY99	FY00	FY01
AF	0.5	1.0	0.5	0.0	0.0
OSD/AT	TBD	TBD	TBD	TBD	TBD

PLAYERS:

- AIA, AFMC, JC2WC, AFIWC, CINC SPONSOR
- ACC, ROME LABS, ARPA

SCHEDULE:

- DESIGN AND FAB—OCT 96 THRU JAN 98
- FIELD TESTS—AUG 97, SEP 98, AUG 99
- FIELD DEMO—4QFY98, 4QFY99

STATUS:

- IW INITIATIVE PROGRAM ONGOING/FUNDED
- ACTD OPERATIONALIZES PRDUCTS OF IW INITIATIVE

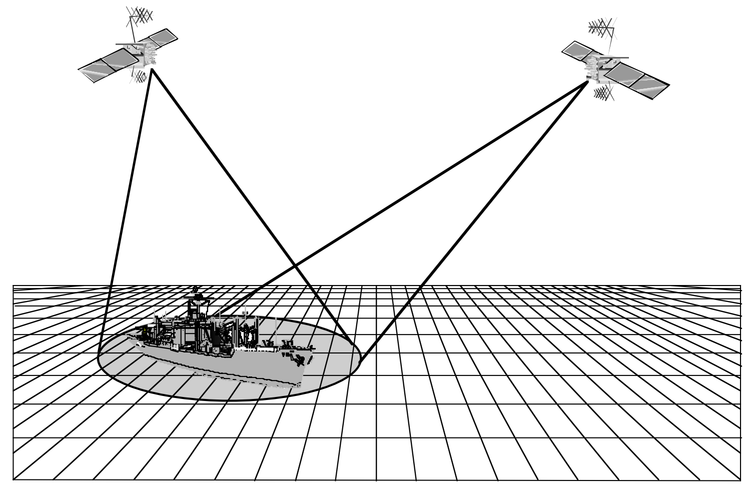
INFORMATION WARFARE PLANNING TOOL DECISION CRITERIA		
OPERATIONAL CAPABILITY	**CURRENT CAPABILITY**	**END GOALS**
IW PLANNING TOOL TO SUPPORT INTEGRATED AIR DEFENSE SYSTEMS	NONE	CLASSIFIED
INTEGRATE ADDITIONAL IW PLANNING TOOLS	NONE	CLASSIFIED

NAVIGATION WARFARE

OBJECTIVE:
- DEVELOP CONOPS FOR OPERATING GPS IN A STRESSED ENVIRONMENT.
- DEMONSTRATE OUR ABILITY TO:
  —DENY ENEMY USE OF GPS
  —PROTECT USE OF GPS BY FRIENDLY FORCES

ISSUES:
- SUPPORTABILITY OF RESIDUALS
- FUNDS

STATUS:
- ID SIGNED
- MANAGEMENT PLAN IN DEVELOPMENT
- INITIAL CONOPS IN DEVELOPMENT



SCHEDULE AND FUNDING:

MILESTONE	FY96	FY97	FY98	FY99	FY00
IDENTIFY OPERATING PARAMETERS AND CRITICAL SCENARIOS					
DEVELOP/REVISE CONOPS					
PARTICIPATE IN THEATER EXERCISES					
RESIDUAL EQUIPMENT					
FUNDING ($M)	15.0	14.0	7.6	7.1	3.9

PLAYERS:
- GPS JOINT PROJECT OFFICE
- USACOM LEAD USER

SCHEDULE:
- DEMONSTRATIONS IN FY96-99.

NAVIGATION WARFARE DECISION CRITERIA		
OPERATIONAL CAPABILITY	**CURRENT CAPABILITY**	**END GOALS**
PROTECT USE OF GLOBAL POSITIONING SYSTEM	MILITARY SIGNAL DIFFICULT TO ACQUIRE IN THE PRESENCE OF JAMMING FOR SOME RECEIVERS	CLASSIFIED
LIMIT HOSTILE FORCE USE OF GLOBAL POSITIONING SYSTEM	PURPOSEFUL DEGRADATION OF CIVIL SIGNALS, I.E., SELECTIVE AVAILABILITY	CLASSIFIED

J. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION AND ADVANCED TECHNOLOGY DEMONSTRATION PROGRAM SUMMARIES FOR CHEMICAL/BIOLOGICAL AGENT DETECTION

J. CHEMICAL/BIOLOGICAL AGENT DETECTION

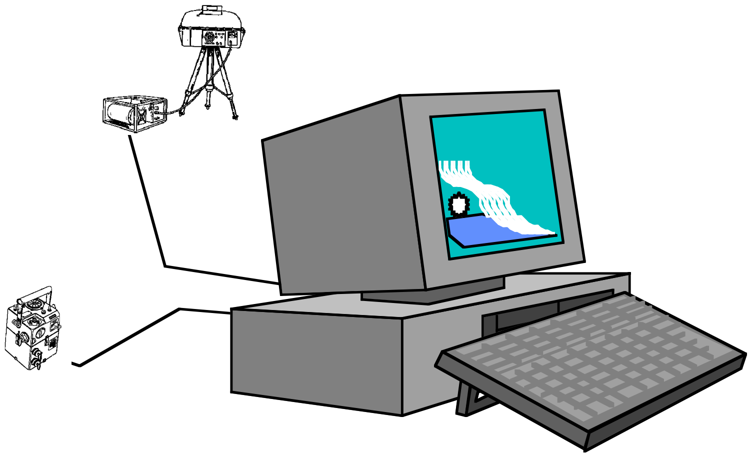
CHEMICAL AND BIOLOGICAL (C/B) MODELING

OBJECTIVE:

- **DEVELOP, VERIFY, VALIDATE, AND DOCUMENT A HAZARD ASSESSMENT MODEL FOR OPERATIONAL USE. DEMONSTRATE ABILITY TO EVALUATE THE OPERATIONAL PERFORMANCE OF REPRESENTATIVE EARLY WARNING C/B DETECTOR SYSTEMS USING THE DISTRIBUTED INTERACTIVE SIMULATION (DIS). STANDARDIZE A JOINT SUITE OF MODELS FOR ALL STUDIES, ANALYSES, SIMULATIONS, AND OPERATIONAL APPLICATIONS. PROVIDE A DOCUMENTED DIS COMPLIANT JOINT CAPABILITY FOR THE FULL RANGE OF C/B WARFARE HAZARD ANALYSES FOR MATERIAL DEVELOPMENT, COMBAT DEVELOPMENT, TRAINING, TEST AND EVALUATION, COEAs, AND OPERATIONAL REQUIREMENTS.**

JUSTIFICATION:

- **PROVIDES C/B HAZARD ASSESSMENT AND FORECASTING CAPABILITY FOR OPERATIONAL USE.**
- **PROVIDES WARFIGHTERS EFFECTIVE METHODS OF EVALUATING OPERATIONAL EFFECTIVENESS OF PERSONNEL, EQUIPMENT, AND DOCTRINE IN C/B ENVIRONMENTS.**



SCHEDULE AND FUNDING:

MILESTONES	FY96	FY97	FY98	FY99	FY00	FY01
HAZARD ASSESSMENT MODEL FOR OPERATIONAL USE	▲					
DEMONSTRATE EVALUATION OF EARLY WARNING SYSTEMS ON DIS		▲				
STANDARDIZE JOINT SUITE OF MODELS				▲		
COMPLETE ALGORITHMS FOR INCORPORATION INTO JOINT WARNING AND REPORTING NETWORK						▲
FUNDING ($M)	12.9	9.6				

FUNDING FOR 98 AND LATER APPROX. $12-15M/YEAR.

APPROACH:

- **USE C/B MODELING PROCESS ACTION TEAM (PAT) TO DEFINE STANDARD SCENARIOS AND MEASURES OF EFFECTIVENESS FOR SELECTING MODELS FOR VARIOUS OPERATIONAL AND ANALYTICAL APPLICATIONS.**
- **DEVELOP ADVANCED NAVIER-STOKES AND GAUSSIAN MODELS WHICH IMPROVE THE INTEGRATION OF REAL-TIME METEOROLOGICAL DATA, TERRAIN CONDITIONS, DETECTOR DATA, AND OTHER DATA WITH WARNING AND REPORTING SYSTEMS.**
- **INCORPORATE MODELS INTO WARGAMES AND EXERCISES.**

CHEMICAL AND BIOLOGICAL (C/B) MODELING DECISION CRITERIA		
OPERATIONAL CAPABILITY	**CURRENT CAPABILITY**	**END DTO GOALS**
BIO AGENT CLOUD	LIMITED CONSTRUCTIVE	CONSTRUCTIVE/VIRTUAL DIS
POINT DETECTION COMPONENT	NONE	CONSTRUCTIVE/VIRTUAL DIS
EARLY WARNING COMPONENT	NONE	CONSTRUCTIVE/VIRTUAL DIS
SUITE PERFORMANCE	LIMITED CONSTRUCTIVE	CONSTRUCTIVE/VIRTUAL DIS
SYSTEM PERFORMANCE	LIMITED CONSTRUCTIVE	CONSTRUCTIVE/VIRTUAL DIS
PERFORMANCE INTEGRATION	LIMITED CONSTRUCTIVE	CONSTRUCTIVE/VIRTUAL DIS
COMMANDER'S DECISION AID	NONE	CONSTRUCTIVE/VIRTUAL DIS
STANDARDIZED MODELS	NO	YES

PROPOSED BIOLOGICAL EARLY WARNING ACTD

OBJECTIVE:

- **PROVIDE AS MUCH WARNING TIME AS POSSIBLE TO MANEUVER FORCES AND TROOPS DOWNWIND OF A BIOLOGICAL AGENT RELEASE TO ALLOW FORCES TO ASSUME APPROPRIATE PROTECTIVE POSTURE OR AVOID THE CONTAMINATION. DEVELOP AND DEMONSTRATE EARLY WARNING (STANDOFF AND REMOTE) BIODETECTION SYSTEMS TO DETECT, IDENTIFY, AND CHARACTERIZE BW AGENTS AND WHICH CAN BE INTEGRATED INTO WARNING AND REPORTING SYSTEMS.**

JUSTIFICATION:

- **SUPPORTS CINC/JROC #1 COUNTERPROLIFERATION JWCA PRIORITY.**
- **PROTECTS MANEUVER FORCES AND TROOPS FROM UPWIND RELEASE OF BIOLOGICAL AGENT.**

SCHEDULE AND FUNDING:

MILESTONES	FY96	FY97	FY98	FY99	FY00	FY01
JOINT BIODETECTION FIELD TRIALS	△	△	△	△	△	△
INCORPORATE INTEGRATED BIODETECTION ATD INTO JOINT WARFIGHTING EXPERIMENT			▲			
DEVELOP STANDOFF LIDAR BIODETECTOR		▲				
DEVELOP MINIATURIZED REMOTELY-EMPLOYABLE BIODETECTOR		▲				
DEVELOP UNATTENDABLE POINT SENSORS				▲		
FUNDING ($M) **(for integrated Bio ATD)**	**22.1**	**21.1**	**32.9**	**48.2**	**4.0**	**4.0**

APPROACH:

- **EMPLOY BIOLOGICAL SENSORS SELECTED FROM THE INTEGRATED BIODETECTION ATD AND JOINT FIELD TRIALS.**
- **DEVELOP STANDOFF, HELICOPTER MOUNTED, EYE-SAFE LIDAR**
- **DEVELOP MINIATURIZED BIOLOGICAL POINT DETECTORS FOR DEPLOYMENT ON REMOTELY-CONTROLLED VEHICLES (E.G., UNMANNED AERIAL VEHICLES)**
- **DEVELOP UNATTENDABLE BIOLOGICAL POINT DETECTION SYSTEMS**
- **DEVELOP AND VALIDATE NEW CONCEPTS OF OPERATIONS FOR BIOLOGICAL DEFENSE**

BIOLOGICAL EARLY WARNING ACTD DECISION CRITERIA		
OPERATIONAL CAPABILITY	**CURRENT CAPABILITY**	**END DTO GOALS**
POINT BIOSENSOR		
DETECTION TIME	15 MINUTES	10 MINUTES
SENSITIVITY		
DETECT MODE	25 ACPLA*	1 ACPLA
IDENTIFY MODE	25 ACPLA	1 ACPLA
OPERATOR INTERFERENCE	MANUAL	SEMI-AUTOMATIC
LOGISTICS BURDEN	MULTIPLE REAGENTS	SINGLE STEP ASSAYS
REAGENT STABILITY	REFRIGERATED	REFRIGERATED
STANDOFF BIOSENSOR		
DETECTION	GENERIC (AEROSOL)	SPECIFIC (BIOAEROSOL)
RANGE	5-30 KM	5-100 KM
RANGE RESOLVED	YES	YES
CONTAMINATION MAPPING	YES	YES
QUANTIFICATION	NO	YES

*AGENT CONTAINING PARTICLES PER LITER OF AIR

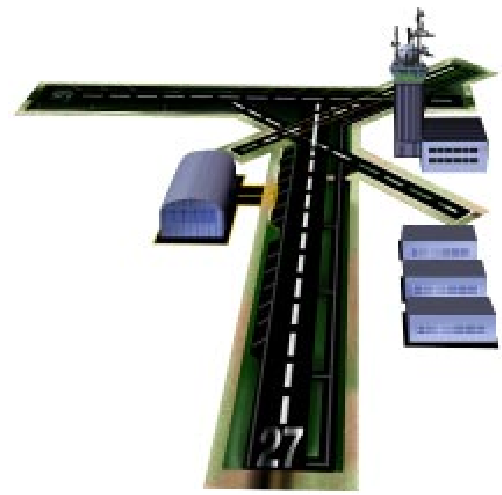
AIRBASE/PORT BIODETECTION ACTD

OBJECTIVE:

- **PROVIDE EXTENSIVE BIOLOGICAL WARFARE AGENT DETECTION, PROTECTION, AND HAZARD ASSESSMENT CAPABILITY TO AIR PORTS OF DEBARKATION (APOD) AND SEA PORTS OF DEBARKATION (SPOD) IN ALLIED COUNTRIES. DEMONSTRATE THE ABILITY TO PROVIDE CONTINUOUS DETECTION CAPABILITIES AT OCONUS APODs AND SPODs, AND DEMONSTRATE ABILITY TO RAPIDLY DEPLOY BIOLOGICAL DEFENSE CAPABILITY FROM CONUS TO PREVIOUSLY UNPROTECTED APOD OR SPOD.**

JUSTIFICATION:

- **SUPPORTS CINC/JROC #1 COUNTERPROLIFERATION JWCA PRIORITY.**
- **PROTECTS HIGH-VALUE FIXED SITES FROM BIOLOGICL WARFARE ATTACK.**



SCHEDULE AND FUNDING:

MILESTONES	FY96	FY97	FY98	FY99	FY00	FY01
DEFINE APOD/SPOD BIODEFENSE REQUIREMENTS	▲					
SELECT SENSORS, SET UP BIODEFENSE NETWORK, DEVELOP OPERATIONAL CONCEPTS; DEMONSTRATE AT CONUS SITE		▲				
FULLY EQUIP ONE PORT AND ONE AIRFIELD			▲			
DEMONSTRATE RAPIDLY DEPLOYABLE APOD/SPOD BIODEFENSE CAPABILITY				▲		
FUNDING ($M)	3.8	6.0	19.0	4.0	2.0	0

APPROACH:

- **DEFINE THE REQUIREMENTS OF A CINC MAJOR FACILITY IN CONJUNCTION WITH THE THREAT FROM BW AGENTS**
- **ANALYZE THE PLACEMENT OF SENSORS, COMMUNICATIONS NETWORK, PROTECTION, AND DECONTAMINATION NEEDS**
- **MODIFY CURRENT OPERATIONAL CONCEPTS AND PROCEDURES**
- **DEFINE THE TRAINING AND LOGISTICAL SUPPORT**
- **EMPLOY BIOLOGICAL SENSORS SELECTED FROM THE INTEGRATED BIODETECTION ATD AND JOINT FIELD TRIALS**

AIRBASE/PORT BIODETECTION ACTD DECISION CRITERIA		
OPERATIONAL CAPABILITY	**CURRENT CAPABILITY**	**END DTO GOALS**
BIOLOGICAL POINT DETECTION FOR APODs/SPODs	NONE	AT ALL HIGH VALUE SITES
OPERATIONAL CONCEPT	YES	INCORPORATE NEW SYSTEMS AND TECHNOLOGIES
RAPIDLY DEPLOYABLE BIODEFENSE CAPABILITIES	NO	YES
BIODEFENSE INTEGRATED INTO SITE DEFENSE	NO	YES

INTEGRATED BIODETECTION ATD

OBJECTIVE:

- FABRICATE, DEMONSTRATE, AND INTEGRATE STATE-OF-THE-ART POINT BIODETECTION TECHNOLOGIES INTO THE BIOLOGICAL INTEGRATED DETECTION SYSTEM (BIDS) AND JOINT BIO POINT DETECTION SYSTEM (JBPDS).
- INCORPORATE STANDOFF BIOLOGICAL AGENT DETECTION AND MAPPING USING ACTIVE LASER DETECTION AND RANGING.
- INTEGRATE POINT AND STANDOFF BIODETECTION TECHNOLOGIES INTO AN INTEGRATED BATTLEFIELD DETECTION SYSTEM.

JUSTIFICATION:

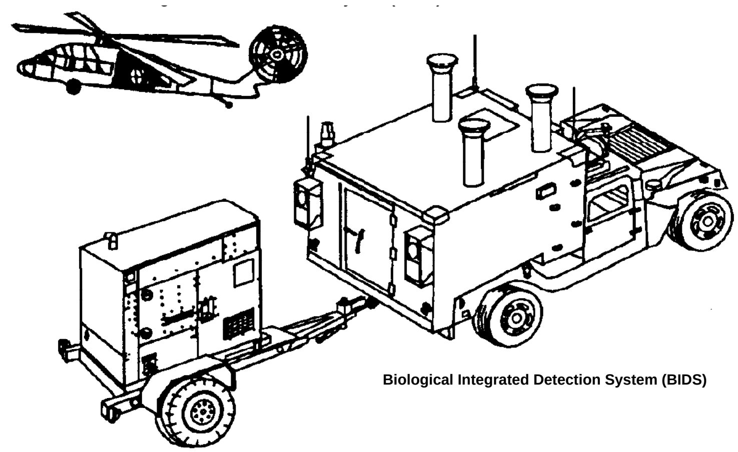
- PROVIDES INCREASED DECISION CYCLE FOR COMMANDERS.
- ENHANCES OVERALL FORCE MOBILITY AND SURVIVABILITY FOR HEAVY AND LIGHT FORCES.
- CRITICAL FOR EARLY MASKING, "ALL CLEAR" SIGNAL, AND EARLY TREATMENT.

BATTLELAB

- DISMOUNTED BATTLESPACE

PEO:

- JPO-BIO DEFENSE



Biological Integrated Detection System (BIDS)

SCHEDULE AND FUNDING:

MILESTONES	FY95	FY96	FY97	FY98	FY99
6.2 SUPPORTING TECHNOLOGIES	█	█	█	█	
M&S/OPERATIONAL EVALUATION		█	█	█	█
FAB/DEMO POINT DETECTORS		█	█		
USER TEST POINT DETECTORS			█		
FAB/DEMO STANDOFF DETECTORS			█	█	
USER TEST STANDOFF DETECTORS				█	
HARDWARE INTEGRATION & DEMO					█
FUNDING ($M)	8.5	12.5	14.5	15.6	6.1

APPROACH:

- DEMONSTRATE PARALLEL POINT BIOSENSOR TECHNOLOGIES AND RESOLVE TECHNICAL BARRIERS TO REDUCE RISK.
- DEVELOP AND DEMONSTRATE STANDOFF BIODETECTION SYSTEMS USING ADVANCED LIGHT SCATTERING TECHNIQUES.
- CONDUCT DEVELOPER/USER FIELD DEMO TO SIMULATE/VALIDATE AN INTEGRATED BIO POINT/STANDOFF OPERATION UNDER CB MISSION CONDITIONS.

APPLICATIONS:

- BIDS, JBPDS
- BIO STANDOFF DETECTION SYSTEM (BSDS) P3I
- AERIAL SCOUT SENSOR TD

INTEGRATED BIODETECTION ATD EXIT CRITERIA

OPERATIONAL CAPABILITY	CURRENT CAPABILITY	END ATD GOALS
POINT BIOSENSOR	15 MINUTES	5 MINUTES
ASSAY TIME		
SENSITIVITY	25 ACPLA*	1 ACPLA
DETECT MODE	25 ACPLA*	1 ACPLA
IDENTIFY MODE	MANUAL	AUTOMATIC
OPERATOR INTERFACE	MULTIPLE REAGENTS	SINGLE STEP ASSAYS
LOGISTICS BURDEN	REFRIGERATED	AMBIENT STORAGE
REAGENT STABILITY		
STANDOFF BIOSENSOR		
IDENTIFICATION	GENERIC (AEROSOL)	SPECIFIC (BIOAEROSOL)
RANGE	5-30 KM	5-100 KM
RANGE RESOLVED	YES	YES
CONTAMINATION MAPPING	YES	YES
QUANTIFICATION	NO	YES
BATTLEFIELD INTEGRATION	BIDS – BSDS	NETWORK

*ACPLA = AGENT CONTAINING PARTICLES PER LITER OF AIR

K. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION AND ADVANCED TECHNOLOGY DEMONSTRATION PROGRAM SUMMARIES FOR REAL TIME LOGISTICS CONTROL

K. REAL TIME LOGISTICS CONTROL

TOTAL DISTRIBUTION ATD

OBJECTIVES:

- PROVIDE COMMANDERS/LOGISTICIANS AT STRATEGIC, OPERATIONAL, AND TACTICAL LEVELS ENHANCED CAPABILITIES TO PLAN, ANALYZE, MOBILIZE, DEPLOY, SUSTAIN, AND RECONSTITUTE MATERIEL, PERSONNEL, AND FORCES IN COMBAT OR CRISIS RESPONSE SITUATIONS.
- REDUCE LOGISTICS TIMELINES AND SUPPORT COSTS.

JUSTIFICATION:

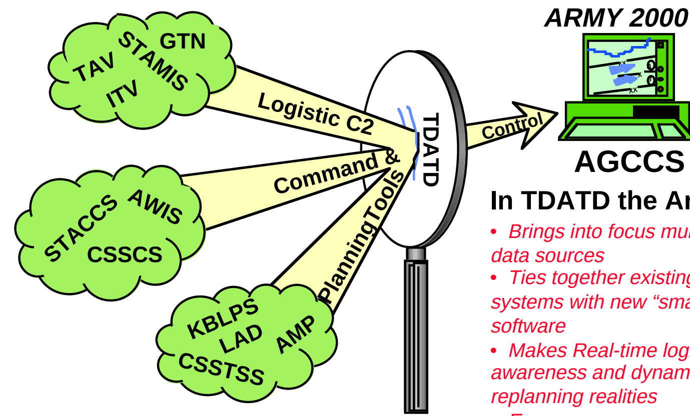
- INADEQUATE AUTOMATION FOR LOGISTIC TASK ORGANIZATION, LOGISTICS COMMUNICATION, SOURCE DATA, AND PROCESSING OF EXTENSIVE, SEPARATED SOURCES.
- INADEQUATE LOGISTICS RELATIONAL DATA BASES AND DOCUMENTATION.
- INABILITY TO TRACK ASSETS IN TRANSIT OR IN PLACE

BATTLELAB:

- COMBAT SERVICE SUPPORT

PEO:

CSSCS
AGCCS



In TDATD the Army:

- *Brings into focus multiple data sources*
- *Ties together existing systems with new "smart" software*
- *Makes Real-time logistics awareness and dynamic replanning realities*
- *Empowers commanders and staffs at all levels*

SCHEDULE AND FUNDING

MILESTONES	94	95	96	97	98	99
INTEGRATION						
• ASSET VISIBILITY TASKS						
• INFRASTRUCTURE TASKS						
• DISPLAY & VISUALIZATION						
• SIMULATION/MODELING TASKS						
• DIL/COE EVALUATION						
• PEO/PM TRANSITION						
EXECUTION						
• CSSCS INTERFACE						
• AGCCS INTERFACE						
• FB2C2 INTERFACE						
• AWE SUPPORT						
LAM/PW	△		△			
AR		△	△			
TFXXI				△		
FUNDING	4.4	8.7	9.6	10.1		

APPROACH:

- INTEGRATE EXISTING LEGACY AND EMERGING LOGISTICS C2 SYSTEMS, DATA BASES, AND STAMIS.
- MERGE TDATD/LAD "NUGGETS" INTO INITIAL BASELINE, THEN CONTINUE BUILDING ON THE LAD FOUNDATION.
- PROVIDE SEAMLESS CONNECTIVITY BETWEEN SOURCES AND USERS OF LOGISTICS INFORMATION.
- COMMON OPERATING ENVIRONMENT (COE) COMPLIANCE.
- VALIDATE CONCEPTS AND CAPABILITIES THROUGH THE CECOM DIGITAL INTEGRATION LABORATORY (DIL) AND AWEs.
- PROVIDE INITIAL PRODUCTS ON A STAND-ALONE WORKSTATION, THEN AS A CLIENT-SERVER ARCHITECTURE, AND FINALLY AS SOFTWARE MODULES FOR HOST SYSTEM INSTALLATION.
- TRANSITION ATD PRODUCTS TO PM/PEO MANAGED SYSTEMS FOR FURTHER DEVELOPMENT OR HOST PLATFORM INSTALLATION.

APPLICATIONS:

- PM, COMBAT SERVICE SUPPORT CONTROL SYSTEM (CSSCS)
- PM, ARMY GLOBAL COMMAND AND CONTROL SYSTEM (AGCCS) LOGISTICS FUNCTION
- U.S. ARMY TOTAL ASSET VISIBILITY (TAV)

TOTAL DISTRIBUTION ATD EXIT CRITERIA			
OPERATIONAL SHORTFALLS	**ATD THRESHOLD**	**ATD GOAL**	**PROTOTYPE THRESHOLD CAPABILITY**
Distribution Management	• Demonstrate a Semi-Automated Alert & Correlation of Logistically Related Problems/Needs • Simulate Semi-Automated Interface to Distributed Logistics Databases	• Demonstrate an Automated Alert & Correlation • Demonstrate an Automated Interface to Distributed Logistics Databases	• Automatic Alert & Correlation • Networked, Collaborative, Automatic Capability to Interface with Distributed Logistics Databases
Automation/Communications	• Demonstrate an Automated Link of Logistics Databases/ Systems	• Demonstrate an Automated Link of Logistics Databases/ Systems	• Automatic Electronic Updating of Logistics Databases/ Systems
In Transit/Total Asset Visibility	• Emulate Automated Source Data • Automate and Process 2500 Logistics Data Items (Sources) [≈ company size unit] • Locate Convoy on a Digital Map • Locate Supplies on the Installation or Containment Areas	• Demonstrate Semi-Automated Source Data • Automate and Process 160,000 Sources [≈ division size unit] • Locate Convoy on a Digital Map • Locate Supplies in a Specific Location; e.g. Supply Point or Distribution Activity Within 5 Meters	• Automatic Correlation to Source Data • Automate and Process ≥1,000,000 Sources [≈ two corps in each of two theaters] • Identify a Particular Vehicle/Container with Specific Supplies • Pinpoint Location of Supplies Down to Individual Boxes

JOINT LOGISTICS ACTD

OBJECTIVE: ***TO PROVIDE CINCs AND CJTFs WITH THE CAPABILITY TO PLAN AND EXECUTE MORE RESPONSIVE AND EFFICIENT LOGISTICS SUPPORT.***

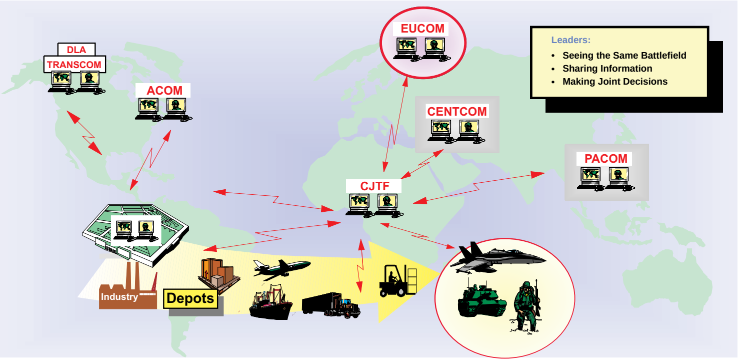
- NETWORK OF WORKSTATIONS CONNECTING OPERATIONAL PLANNERS AND LOGISTICIANS ACROSS SERVICES AND ECHELONS.
- ADVANCED DATA DISTRIBUTION AND VISUALIZATION TECHNIQUES TO PROVIDE A COMMON, RELEVANT PICTURE.
- INTEGRATION OF EXISTING LOGISTICS MODELS WITH KNOWLEDGE-BASED TOOLS TO PROVIDE DECISION SUPPORT.
- GCCS COMPLAINT.

JUSTIFICATION:

- LIMITED END-TO-END SUSTAINMENT C2.
- DECISION SUPPORT TOOL STOVEPIPED.
- LACK OF COLLABORATIVE PLANNING CAPABILITY.

BATTLELAB:

- CSS BATTLE LAB



SCHEDULE

MILESTONES	FY94	FY95	FY96	FY97	FY98
TRANSCOM	▲ AMP/FPM				
		▲ GTN			
	▲ TRAC2ES				
DLA		▲ ICIS			
ARPA	▲ LOGGEN				
			▲ TRANSTECH/LOG FOR THE WARRIOR		
		▲ AJP ACTD			
ARPA AND ARMY		▲ Voice Activated LAD			
		▲ Visage			
	▲ GLAD				
ARMY	▲ KBLRS				
	▲ CIP,3d VIS, DB Access				
	▲ TD ATD				
		▲ Digital Battlefield Communications ATD			
	▲ Combined Arms C2 ATD				
		▲ Mission Planning			
OTHER SERVICE PROGRAMS			▲ To Be Determined		

APPROACH:

- APPLY MATURE DoD AND COMMERCIAL TECHNOLOGY TO CRITICAL LOGISTICS PROBLEMS.
- PROVIDE SIGNIFICANT IMPROVEMENT IN MISSION CAPABILITY THROUGH ENHANCED LOGISTICS SITUATIONAL AWARENESS AND PREDICTIVE MODEL/SIMULATION TOOLS.
- PROVIDE CAPABILITY TO RAPIDLY PLAN AND EXECUTE MORE RESPONSIVE AND EFFICIENT LOGISTICS SUPPORT.

JOINT LOGISTICS ACTD EXIT CRITERIA

THE PRIMARY EVALUATION METRIC RELATES TO THE DEMONSTRATED ABILITY TO HANDLE USER NEEDS IN DIVERSE PROGRAM-MISSION AREAS. USER CRITERIA WILL REFLECT COMPLIANCE WITH THE STRATEGIC AND TACTICAL OBJECTIVES OF THE PARTICULAR PROGRAM MISSION AREA.

- AUTOMATED ACCESS TO RELEVANT JOINT DATA, INCLUDING FORCES, LOGISTICS, AND INFRASTRUCT URE.
- INTERFACES WITH JOINT PLANNING TOOLS DEVELOPED BY THE ADVANCED JOINT PLANNING ACTD.
- ADVANCED VISUALIZATION TOOLS FOR LOGISTICS DATA THAT WILL PROVIDE A COMMON, RELEVANT LOGISTICS PICTURE WITH A SINGLE INTERFACE USABLE BY ALL SERVICES.
- PLANNING TOOLS TO ALLOW DYNAMIC RESOURCE ALLOCATION ACROSS SERVICES.
- JOINT COURSE OF ACTION GENERATION, ANALYSIS, AND COMPARISON OF LOGISTICS PLANS.
- GREATER DETAIL AND ACCURACY IN COMMUNICATING LOGISTICS MISSION ORDERS AND REQUIREMENTS.
- EXECUTION MONITORING TOOLS LINKED TO THE LOGISTICS PLAN.
- ENABLING TECHNOLOGIES TO FACILITATE INTERPERSONAL COMMUNICATIONS.
- DEMONSTRATE UTILITY OVER GARRISON, TACTICAL, AND COMMERCIAL COMMUNICATIONS.
- REDUCED ADMINISTRATIVE REQUIREMENTS FOR COMMUNICATIONS ENGINEERING.

L. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION AND ADVANCED TECHNOLOGY DEMONSTRATION PROGRAM SUMMARIES FOR COUNTERPROLIFERATION

L. COUNTERPROLIFERATION

MEDICAL BIOLOGICAL DEFENSE

OBJECTIVE:

- **DEVELOP, DEMONSTRATE, AND FIELD NEW VACCINES, DRUGS, AND DIAGNOSTIC KITS FOR PREVENTION, TREATMENT, AND DIAGNOSIS OF BIOLOGICAL WARFARE AGENTS. THIS DTO WILL PROTECT FORCES FROM THE CONSEQUENCES OF EXPOSURE TO BIOLOGICAL AGENTS AND FORCE SURVIVABILITY AND MISSION ACCOMPLISHMENT. THIS DTO WILL BE ACCOMPLISHED THROUGH THE DEVELOPMENT OF SEVERAL VACCINES, DRUGS, AND OTHER MEDICAL PRODUCTS TO DEFEND AGAINST ALL VALIDATED BIOLOGICAL WARFARE THREATS.**

JUSTIFICATION:

- **PROVIDES CONTINUOUS PROTECTION AGAINST BIOLOGICAL WARFARE AGENTS.**
- **SUPPORTS CINC/JROC COUNTERPROLIFERATION, JWCA PRIORITIES #6, #7, AND #8.**

SCHEDULE AND FUNDING:

MILESTONES	FY96	FY97	FY98	FY99	FY00	FY01
RICIN TOXIN VACCINES		▲ MS0			▲ MS1	
PLAGUE VACCINE (advanced development)			▲			
FIELD DEPLOYABLE DIAGNOSTIC KIT (transition to advanced development)			▲			
BOTULINUM TOXIN VACCINE (transition to advanced development)				▲		
VEE/WEE/EEE (transition to advanced development)					▲	
FUNDING ($M)	21.1	22.2	26.5	28.2	28.4	29.1

APPROACH:

- **DEVELOP NEW OR IMPROVED VACCINES TO PREVENT EFFECTS OF BIOLOGICAL WARFARE AGENTS.**
- **DEVELOP NEW OR IMPROVED DRUGS AND MEDICAL TREATMENT TO COUNTER THE EFFECTS OF BIOLOGICAL WARFARE AGENTS FOLLOWING AGENT EXPOSURE.**
- **DEVELOP NEW OR IMPROVED PORTABLE DIAGNOSTIC KITS FOR IMMEDIATE DIAGNOSIS OF CASUALTIES IN THE FIELD IN ORDER TO ALLOW EARLIEST APPLICATION OF MEDICAL TREATMENT.**

MEDICAL BIOLOGICAL DEFENSE

OPERATIONAL CAPABILITY	CURRENT CAPABILITY	END DTO GOALS
ANTHRAX VACCINE	LIMITED	IMPROVED
BOTULINUM TOXOID	STRAINS A-E	ALL AGENT STRAINS
PLAGUE VACCINE	YES (NO PROTECTION AGAINST INHALATION HAZARD)	YES (PROTECTION AGAINST INHALATION HAZARD0
SEB TOXIN VACCINE	NO	YES
VEE/WEE/EEE VACCINE	NO	YES
FIELD DEPLOYABLE DIAGNOSTIC KIT	NO	YES

MEDICAL CHEMICAL DEFENSE

OBJECTIVE:

- DEVELOP, DEMONSTRATE, AND FIELD NEW PROPHYLACTIC MEASURES, DRUGS, AND DIAGNOSTIC KITS FOR PREVENTION, TREATMENT, AND DIAGNOSIS OF CHEMICAL WARFARE AGENTS. THIS DTO WILL PROTECT FORCES FROM THE CONSEQUENCES OF EXPOSURE TO CHEMICAL AGENTS AND FORCE SURVIVABILITY AND MISSION ACCOMPLISHMENT. THIS DTO WILL BE ACCOMPLISHED THROUGH THE DEVELOPMENT OF SEVERAL DRUGS AND OTHER MEDICAL PRODUCTS TO DEFEND AGAINST ALL CHEMICAL WARFARE THREATS.

JUSTIFICATION:

- PROVIDES CONTINUOUS PROTECTION AGAINST CHEMICAL WARFARE AGENTS.
- SUPPORTS CINC/JROC COUNTERPROLIFERATION, JWCA PRIORITIES #6 AND #7.

SCHEDULE AND FUNDING:

MILESTONES	FY96	FY97	FY98	FY99	FY00	FY01
VESICANT AGENT COUNTERMEASURES (Milestone 0)					▲	
CATALYTIC/REACTIVE NERVE AGENT PRE-TREATMENT (Milestone 0)				▲		
REACTIVE TOPICAL SKIN PROTECTANT (transition to advanced development)				▲		
FUNDING ($M)	22.3	22.3	24.1	25.8	25.9	26.6

APPROACH:

- DEVELOP VESICANT AGENT COUNTERMEASURES.
- DEVELOP REACTIVE/CATALYTIC NERVE AGENT PROPHYLAXES.
- DEVELOP REACTIVE TOPICAL SKIN PROTECTANT.

MEDICAL CHEMICAL DEFENSE		
OPERATIONAL CAPABILITY	**CURRENT CAPABILITY**	**END DTO GOALS**
VESICANT AGENT COUNTERMEASURES	NO	YES
REACTIVE/CATALYTIC NERVE AGENT PROPHYLAXES	NO	YES
REACTIVE TOPICAL SKIN PROTECTANT	NO	YES

COUNTERPROLIFERATION – COUNTERFORCE – ACTD
PHASES I AND II

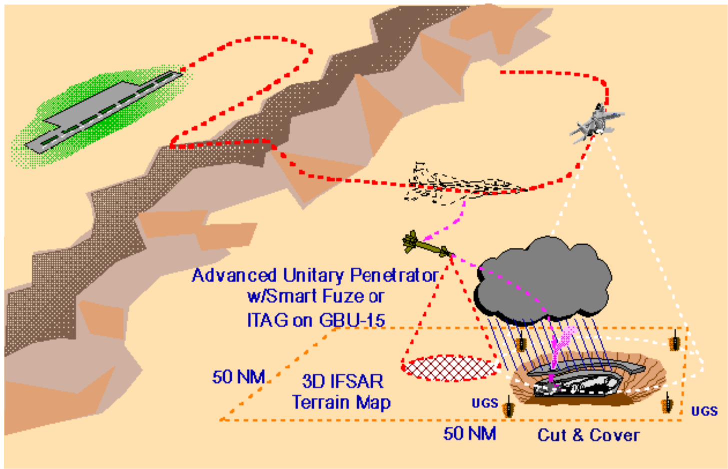
OBJECTIVES:

<u>PHASE I</u> – USE CURRENT/NEAR-TERM TECHNOLOGIES TO DEMONSTRATE CAPABILITIES AGAINST SOFT, ABOVE-GROUND BIOLOGICAL WEAPON STORAGE FACILITY.

<u>PHASE II</u> – USE CURRENT/EMERGING TECHNOLOGIES TO DEMONSTRATE SUBSTANTIALLY IMPROVED CAPABILITIES AGAINST SIMULATED HARDENED, CHEMICAL WEAPON PRODUCTION FACILITIES.

JUSTIFICATION:

THESE TARGETS HAVE BEEN IDENTIFIED AS PRIORITY TARGETS BY CINCs.



SCHEDULE AND FUNDING:

MILESTONES	FY95	FY96	FY97	FY98	FY99	FY00
PHASE I						
PRETESTING						
CALCULATIONAL TOOLS						
SMART FUZE DEVELOPMENT						
DEMONSTRATION TEST		▲				
RESIDUALS						
PHASE II						
PRETESTING						
TOOL IMPROVEMENTS						
WARHEAD DEVELOPMENT						
SENSOR DEVELOPMENT						
SENSOR FUSION						
DEMONSTRATION			▲			
RESIDUALS						
FUNDING ($M)	23.2	54.8	58.6	8.4	6.6	6.6

APPROACH:

- **USE INTELLIGENCE DATA TO CONSTRUCT REALISTIC FACILITIES AS MODELS FOR PHASE II DEMONSTRATION.**
- **COORDINATE WITH USEUCOM ON WEAPON AND ATTACK SCENARIO FOR DEMONSTRATION.**
- **USE POST-ATTACK DAMAGE ASSESSMENT TO EVALUATE TARGET PLANNING AND COLLATERAL EFFECTS MODELS THAT ARE TO BE PROVIDED TO CINCEUR.**
- **PROVIDE RESIDUAL CAPABILITY IN TERMS OF COUNTERFORCE TACTICS, MISSION EFFECTIVENESS MODELS, AND COLLATERAL EFFECTS PREDICTIONS.**

COUNTERPROLIFERATION – COUNTERFORCE – ACTD EXIT CRITERIA PHASES I AND II

THIS ACTD DEVELOPS CALCULATIONAL TOOLS, WEAPON EMPLOYMENT TACTICS, DAMAGE ASSESSMENT, AND COLLATERAL EFFECTS TOOLS AND INTEGRATES THEM TO PROVIDE THE WARFIGHTER A RAPID, LETHAL TARGETING METHODOLOGY WITH MINIMAL COLLATERAL EFFECTS. THIS REQUIRES THAT THE ACTD PHASES I AND II:

- DEMONSTRATE AN OPERATIONAL APPLICATION AGAINST A REASONABLE SIMULATED TARGET (ABOVE GROUND BIOLOGICAL WMD STORAGE FACILITY FOR PHASE I AND A HARDENED CUT-AND-COVER CHEMICAL WMD PRODUCTION FACILITY FOR PHASE II).

- DEMONSTRATE A CAPABILITY TO DETECT AND CHARACTERIZE TARGET FACILITIES, A TARGETING METHODOLOGY TO KILL OR DENY ACCESS, AND AN ABILITY TO REDUCE COLLATERAL DAMAGE RELATIVE TO CURRENT TARGETING TACTICS.

COUNTERPROLIFERATION – COUNTERFORCE – ACTD
PHASES III–V

OBJECTIVE:

DEVELOP METHODOLOGIES, INTEGRATE, DEMONSTRATE, AND TRANSITION TO USERS A CAPABILITY TO DEFEAT OR DENY USE OF BIOLOGICAL, CHEMICAL, AND NUCLEAR WMD-RELATED FACILITIES INCLUDING C3I LOCATED ON THE SURFACE, SHALLOW BURIED, OR DEEPLY BURIED IN TUNNELS.

JUSTIFICATION:

THESE WMD FACILITIES ARE THOSE THAT HAVE NOT BEEN ADDRESSED IN THE PHASES I AND II PROGRAMS. THEY HAVE UNIQUE TARGETING CONCERNS REQUIRING NEW WEAPON/WARHEAD CAPABILITIES TO ADDRESS DEFEAT WHILE MINIMIZING COLLATERAL EFFECTS.

SCHEDULE AND FUNDING:

MILESTONES	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06
PHASE III										
SENSOR SELECTION CHARACTERIZATION AND BDA TOOLS	■	■	■							
SENSOR FUSION	■	■	■							
ENHANCED W/H	■	■	■							
RESIDUALS				■	■	■				
PHASE IV										
COLLATERAL EFFECTS TOOLS			■	■	■					
SENSORS INCLUDING UAV			■	■	■					
ENHANCED WEAPON/PAYLOAD			■	■	■					
RESIDUALS							■	■		
PHASE V										
TOOLS					■	■	■			
SENSORS					■	■	■			
ENHANCED WEAPONS					■	■	■			
RESIDUALS								■	■	■
FUNDING ($M)	5.0	37.2	42.1	43.3	50.0					

APPROACH:

- **USE INTELLIGENCE DATA TO CONSTRUCT REALISTIC FACILITIES.**
- **INVESTIGATE PLANNED FUTURE WEAPON CAPABILITIES THAT MAY APPLY. DEFEAT METHODOLOGIES MAY REQUIRE USE OF SOF.**
- **DEVELOP AND EXECUTE ATTACK PLANS IN COORDINATION WITH CINCs.**
- **PROVIDE RESIDUAL CAPABILITY IN TERMS OF COUNTERFORCE TACTICS, MISSION EFFECTIVENESS MODELS, AND COLLATERAL EFFECTS PREDICTIONS.**

COUNTERPROLIFERATION – COUNTERFORCE – ACTD EXIT CRITERIA PHASES III–V

THESE PHASES OF THE ACTD MUST DEMONSTRATE A CAPABILITY TO IDENTIFY, CHARACTERIZE, TARGET, AND KILL OR DENY USE OF BIOLOGICAL, CHEMICAL, AND NUCLEAR WMD-RELATED FACILITIES WHILE MINIMIZING COLLATERAL EFFECTS RESULTING FROM DAMAGE TO TARGETED FACILITIES.

- A SUCCESSFUL DEMONSTRATION MUST BE EXECUTED AGAINST REPRESENTATIVE TARGET SETS: SURFACE TRANSPORTER ERECTOR LAUNCHERS (TELs), TELs IN TUNNEL, AND BIOLOGICAL WMD PRODUCTION AND LOAD & FILL FACILITIES, NUCLEAR WMD PRODUCTION FACILITIES, NUCLEAR WMD C3I FACILITIES, AND DEEPLY BURIED (E.G., TUNNEL EMPLACED) FACILITIES.

- THE PRODUCTS OF THIS EFFORT WILL BE DEMONSTRATED WEAPON AND SENSOR SYSTEMS AS WELL AS TARGET PLANNING TOOLS, AND BDA TOOLS UPDATED AND EXPANDED TO ADDRESS EACH OF THE TARGET AND WEAPON SYSTEMS EMPLOYED FOR THIS TARGET SET.

- RESIDUAL ITEMS TO BE SUPPORTED FOR TWO YEARS AFTER THE DEMONSTRATION INCLUDE: HARDWARE, TOOLS, AND SENSORS.